HORTICULTURAL ABSTRACTS

ol. XVI December 1946 No. 4

Initialled reviews are by E. S. J. Hatcher and W. A. Roach of the East Malling Research Station and by H. C. Chapelow and G. St. C. Feilden.

INDEX OF CONTENTS.

N.B.—Numbers sub-divided alphabetically refer to items noted but not abstracted.

MISCELLANEOUS.

Technique.

). BATEMAN, M. 016: 05

Some general desk reference books.

Proc. 20th Conf. Aslib 1945, 1946, pp. 84-8, obtainable Aslib, 52 Bloomsbury Street, London, W.C.1, 6s.

ist essentially for the English librarian, compiled by a nber of the Cambridge University Library staff. Lib- ans overseas would find it useful but would certainly to add to it.

. STANILAND, L. N. 741: 578.08

Simple laboratory and field apparatus for the production of accurate line drawings to scale.

Ann. appl. Biol., 1946, **33**: 170-7.

aratus is described by the use of which accurate scale vings may be made of plants or other biological material the study of growth changes or the development of ase symptoms. The apparatus has other uses, e.g. rgement of drawings, etc., and these are also described. mples of drawings made with the apparatus are included. simple principles involved are:—A sheet of clear glass t up vertically. A small "peep-sight" is placed on side of the glass and the object is placed on the other

On looking through the sight the object is seen and utline can be accurately traced by means of a pen and an ink on the surface of the glass. The object of the is to avoid movements of the eye resulting in effects arallax.

. BOMFORD, D. R. 635.1/7: 631.51

Horticultural machinery.

Farming, 1946, **1**: 119-22.

application of machine power to hand work is one of chief needs of the horticulturist and in the past little been done to supply such power. Nowadays high costs abour and of keeping horses in intensive market garden areas of high rental values, where oats and grass are both uneconomic crops, make the need even greater. In the last two years several self-propelled tool bars have been introduced, notably the Bean, McConnel, Watkins and Atom machines, and have proved extremely interesting to horticulturists. Accuracy is essential, and it has been provided by attention to principles which are enumerated in this article. The author discusses at some length the possibility that machines of this type may be so adapted as to be able to plough, cultivate, transplant, hoe, harvest, etc., and notes where new developments can be expected, which will enable one machine to fulfil the many functions demanded of it by the horticulturist. A most usefully suggestive article.

1733. FILATOV, F. I. 581.14: 63

The control of plant development. [Russian.] Saratov Province State Publishers, Saratov, 1941, 24 pp. 2.65 roubles. [Received August 1946.]

A general account of raising cultivated plants, with special reference to the work of Mičurin and Lysenko, including biographies of Darwin, Timirjazev and Burbank.

1734. JOHNSON, D. A., AND WOODMAN, R. M. 631.589: 663.61

Plant growth with nutrient solutions. I. A brief review of existing work.

J. agric. Sci., 1946, **36**: 69-79, bibl. 153.

In an excellent reference article the authors deal with the history of water culture and its progress up to the present time.

1735. WOODMAN, R. M., AND JOHNSON, D. A. 631.589: 663.61

Plant growth with nutrient solutions. II. A comparison of pure sand and fresh soil as the aggregate for plant growth.

J. agric. Sci., 1946, **36**: 80-6, bibl. 13.

Statistical experiments have been carried out as pot cultures

in the greenhouse, with sand and soil as the aggregates (nutrients being supplied to both aggregates in the form of nutrient solutions), on the growth of the two vegetables, turnip and spring cabbage, to the stage of maturity usual in actual practice. With full nutrients, the soil, possibly because of such factors as its nutrient reserves, its physical properties, and its capacity for retaining certain nutritional elements supplied, was superior to the sand as judged by yields of fresh and dry matter of tops and whole plants of both vegetables, and roots in turnip. [From authors' summary.]

1736. WOODMAN, R. M., AND JOHNSON, D. A. 631.589: 663.61
Plant growth with nutrient solutions. III. A comparison of sand and soil as the aggregate for plant growth using an optimum nutrient solution with the sand, and incomplete supplies of nutrients with " once-used " soil.
J. agric. Sci., 1946, **36**: 87-94, bibl. 3.
Experiments are described in which the " once-used " soils left over from previous culture experiments were employed as aggregates in the growth of vegetables. It was demonstrated that sand with full nutrients was superior to " once-used " soil with water only, but that " once-used " soil supplied with the full quota of soluble nitrogen was superior to the sand with full nutrients. [From authors' summary.]—Horticultural Research Station, School of Agriculture, Cambridge.

1737. ROBBINS, W. R. 663.61: 581.084.1: 631.589
Growing plants in sand cultures for experimental work.
Soil Sci., 1946, **62**: 3-22, bibl. 65.
The author describes certain equipment and discusses, in comparison with several other techniques, some of the factors concerned with a technique of continuous solution renewal which has proved satisfactory for sand cultures. The culture vessel (illustrated) is of high-grade white porcelain with an over-all silica glaze. The reservoir shown is a round, 2-quart, clear glass canning jar; a notch is ground in the rim to accommodate the glass capillary delivery tube leading to the culture vessel. The delivery tube is prepared by bending in an S-shape one end of a piece of glass capillary tube 25 cm. long with a bore of about 0·8 mm. This tube delivers nutrient solution at the rate of almost 2 litres a day. The supports, preparation of equipment for use, and the preparation of the plant material are described in detail, and the choice, preparation and application of the nutrient solutions are discussed.

1738. DAVIDSON, O. W. 663.61: 581.084.1: 631.589
Large-scale soilless culture for plant research.
Soil Sci., 1946, **62**: 71-86, bibl. 24.
Descriptions are given of apparatus and operations involved in the three types of large artificial cultures, i.e. (1) solutions (hydroponics), (2) sand, and (3) gravel. Nutrient solutions and methods used in their analysis are discussed, and there is the following note on insect and disease control. Large soilless cultures of all types can be sterilized conveniently and satisfactorily with a 1: 100 solution of formaldehyde in water. It may be important not to attempt to sterilize beds or tanks by this method in the immediate vicinity of growing plants. When sprays or dusts are necessary for insect or disease control the user should know beforehand that they will not interfere with the investigation. There is a wide variety of effective materials from which a safe spray or dust can be chosen. The practice of filling the tanks or beds with water and allowing them to overflow while applying sprays has not been found necessary and may lead to root injury during hot weather. The control of pests by the use of safe fumigants is distinctly preferable to the use of sprays and dusts.

1739. ALBRECHT, W. A. 581.084.1
Colloidal clay cultures—preparation of the clay and procedures in its use as a plant growth medium.
Soil Sci., 1946, **62**: 23-31.
Since the speed of chemical activity increases as the surface of a constant mass increases (or as the mass is finely divided) an attempt was made to analyse the chem interrelations of the soil and plant roots by studying first by using only clay, the most active separate of the The separation and electrodialysis of the clay, the dardization of the suspension and the preparation of growth medium from colloidal clay are described. stated that the colloidal clay cultures are particu serviceable in plant growth studies, in that they pe of accurate chemical scrutiny of seed and soil at the o and of crop and soil at the end of crop growth. By means one is able to study the movements of plant nutr from the clay into the plants and from the plants into clay, as may be the case when nutrient deficiencies occu

1740. MACINTIRE, W. H., AND WINTERBERG, S. H. 581.084.1
Pot method for soil cultures.
Soil Sci., 1946, **62**: 33-41, bibl. 10.
The technique is described. The crop plants tested mostly fodder plants, but soybeans were also used.

1741. SCHUFFELEN, A. C. 631.4+581.192
Het Amerikaansche snelle onderzoek van grond en gewas. **(The American rapid soil and crop investigations.)**
Meded. Direct. Tuinb., 1946, pp. 531-6, bibl. 11.
This is a review of American methods for the rapid exam tion of soils and crops, certain modifications being discussed. The advantages and disadvantages are set and a detailed example of determining the rate of manu is given.

1742. LOO, S.-W. 581.14
Preliminary experiment on the cultivation of *Baeria chrysostoma* under sterile conditions.
Amer. J. Bot., 1946, **33**: 382-9, bibl. 40.
Because of the small size of *Baeria chrysostoma* (a Calif desert annual) at the time of flowering and seed set attempts were made to grow it in sterile culture. It ha advantage that it can be grown in small test tubes, a large number of plants can be conveniently studied in experiment. It was found that *Baeria* plants are ab grow to maturity and produce seeds under aseptic c tions. The best growth was obtained with a day temper of 26° C. combined with a night temperature of 13° C.

1743. GUSTAFSSON, Y. 631.67
Untersuchungen über die Strömungsverhältnisse in gedrântem Boden. **(Investigations on water currents in drained soil.)**
Acta Agric. suec., 1946, **2**: 1-157, bibl. 150.
The highly technical investigation on water currents inc the movement of air in drained soil.—Royal Agricul College, Uppsala.

Growth substances.

1744. WITHROW, R. B., AND HOWLETT, F. S. 577.17
New carriers for plant growth regulators.
Plant Physiol., 1946, **21**: 131-9, bibl. 6, being *J. Pap. Purdue agric. Exp. Stat.* **204**.
Formulae and methods of preparation of several s fluid and cream emulsions employing waxes other lanolin and emulsifying agents other than triethanola stearate are given. Mucilage solution formulae are presented. The cream emulsions do not leave s residues as does lanolin, and they are non-toxic to tissue. Tomato fruit set well when these emulsions

d as carriers for indolebutyric acid. Under conditions high temperature where lanolin and lanolin emulsions toxic, the materials recommended are not injurious. y also offer advantages where physiologically inert iers are desired for materials other than growth regulating stances. [Authors' summary.]

5. BEAL, J. M. 635.65: 577.17
Histological reactions of bean plants to certain of the substituted phenoxy compounds.
Bot. Gaz., 1945, **107**: 200-17, bibl. 11, being *Contr. Hull bot. Lab.* **569**.

histological response to 4 substituted phenoxy com-nds of the bases of nearly full-sized bean leaves is strated by 13 photographic plates. The growth sub-ices were applied at a concentration of 0·5% with bowax 1500 and lanolin as carriers. There were king differences in the response to the treatments of the and second internode, including abundant root develop-t in the former and complete absence of adventitious ts in the latter, even after 20 days. The reactions of vidual tissues of both internodes are described and erences of the effects produced by the 4 compounds the 2 carriers are recorded.

6. WHITING, A. G., AND MURRAY, M. A. 635.65: 577.17
Histological responses of bean plants to phenylacetic acid.
Bot. Gaz., 1946, **107**: 312-32, bibl. 11, being *Contr. Hull bot. Lab.* **571**.

histological response of young bean plants following apitation at the second internode and treatment of the surface with a 2% mixture of phenylacetic acid in olin is discussed and pictured in detail. In decapitated, erwise untreated, seedlings, tumour proliferations were nd to differ histologically from those occurring as a lt of growth substance application to the cut surface. ot primordia were infrequently formed.

7. BROWN, J. W. 635.65: 577.17
Effect of 2,4-dichlorophenoxyacetic acid on the water relations, the accumulation and distribution of solid matter, and the respiration of bean plants.
Bot. Gaz., 1946, **107**: 332-43, bibl. 6.

Bean (*Phaseolus vulgaris*) seedlings were sprayed with dichlorophenoxyacetic acid, mixed with Carbowax as a ersing agent, to determine the toxic effects associated n some of the various physiological responses that the l induces. 2. Within 1 hour, seedlings sprayed with a 00 p.p.m. concentration showed marked epinastic onses and stem bending. At the end of 5 days the nts were permanently wilted, and in 7 days they were d. 3. The total amount of water absorbed and spired by sprayed plants during the 5 days immediately owing treatment was 34% less than that of comparable reated ones. 4. Leaf growth and expansion were kedly inhibited in both partially expanded leaves and se contained in terminal buds, even when sprayed with a centration as low as 25 p.p.m. 5. The solid matter tent of the aboveground part of the plant decreased kedly after spraying with a relatively high concentration 00 p.p.m.), but increased accumulation of solid matter noted in the basal region of the stems of those plants ayed with lower concentrations (25, 50 and 250 p.p.m.). The rate of accumulation of water in the leaves of sprayed nts was depressed, while in the stem tissues it was elerated. 7. The rate of respiration of seedling bean nts measured at three different temperatures was signifi-tly increased as the result of spraying them with an eous mixture containing 0·1% (1,000 p.p.m.) of 2,4-lorophenoxyacetic acid and 0·6% Carbowax 1,500. s increase in respiration was manifest 24 hours after tment. 8. Plants of annual wild morning-glory *moea lacunosa*) sprayed in a similar manner with the l at the time of flowering showed an 80·6% increase in respiration during a 2-hour period on the fourth day after treatment. 9. It is concluded that, of the responses studied, those which most seriously affected the plants include the effect of the acid in depressing the rate of leaf expansion and development and its interference with the usual pattern of transport and utilization of food materials. [From author's summary.]

1748. MITCHELL, J. W., AND BROWN, J. W. 577.17: 581.192
Movement of 2,4-dichlorophenoxyacetic acid stimulus and its relation to the translocation of organic food materials in plants.
Bot. Gaz., 1946, **107**: 393-407, bibl. 16.

Applications of 2,4-dichlorophenoxyacetic acid solution plus Carbowax 1,500 were made on bean plants in order to determine the path of translocation and the effects of light and carbon dioxide on the rate of translocation of the growth stimulus, stem curvature being used as an indication of its presence. Movement of the acid stimulus from leaves was found to occur under conditions favourable to carbohydrate translocation and therefore to be impeded after extended periods of darkness or in CO_2-free air. From leaves, the stimulus was translocated by living cells, probably the phloem, whereas it appeared to travel in the xylem when the acid was applied to the root system. The following practical conclusions may be drawn from these results: The translocation of the 2,4-dichlorophenoxyacetic acid stimulus will be a critical factor in the eradication of deep-rooted perennials or leafy acaulescent perennials, such as dandelion and plantain, especially when these plants are growing vigorously in shaded areas. Spraying the tops of such weeds should therefore be timed so as to coincide with the active translocation of organic food materials from the leaves and stems to the roots. Since bean plants were found to recover quickly after removal of the treated portions of their leaves, it seems important that the tops of dandelion and plantain should not be cut for some time after treatment.

1749. MITCHELL, J. W., AND MARTH, P. C. 631.531.13: 577.17
Germination of seeds in soil containing 2,4-dichlorophenoxyacetic acid.*
Bot. Gaz., 1946, **107**: 408-17, bibl. 8.

The present experiments were undertaken to study the effect of 2,4-dichlorophenoxyacetic acid on the germination and emergence of seeds containing known amounts of the chemical and to determine after what time the acid becomes inactivated in the soil. The possibility of using the substance for the prevention of weed seed germination in the soil was another aspect of the investigation. The results show that 2,4-dichlorophenoxyacetic acid, though fairly stable in dry soil, is very rapidly inactivated in warm, moist soil with a high organic matter content. This property combined with its initial high toxicity suggests that 2,4-dichlorophenoxyacetic acid treatment would be a suitable means of controlling the germination of weed seeds in soils or in organic materials used as mulches or soil amendments. The difference between plant species in sensitivity to the chemical is of special interest in cereals, which show a high degree of resistance, and of dicotyledonous weeds, which as a rule are more susceptible. The principal data obtained include the following: (1) A concentration of 1-14 mg. of the acid per pound of soil reduced the emergence of mustard seed by 80-90% in an acid-soil mixture that had been stored air-dry for 1 month. After a storage period of 18 months plant emergence was still significantly reduced. (2) In the case of barley, concentrations of the acid below 14 mg. per pound of dry soil did not affect emergence significantly after 1 month's storage. (3) A concentration of 20 mg. of the acid in warm, moist soil, relatively high in organic matter, did not significantly reduce the emergence of mustard plants after a storage period of 2 weeks.

* See also 1958, 1959.

1750. Avery, G. S., and Pottorf, L. 631.84: 577.17
Auxin and nitrogen relationships in green plants.
Amer. J. Bot., 1945, **32**: 666-9.
Leaves and growing points of kohlrabi plants grown at different levels of nitrogen nutrition were assayed for their total extractable auxin. The critical range of nitrate concentration in the nutrient solutions, as regards auxin production, is between 0·01 and no nitrogen. The plant produces auxin on much less nitrogen than it takes to affect growth visibly.

1751. Avery, G. S., and Pottorf, L. 631.84: 577.17
Polyploidy, auxin and nitrogen in green plant tissue.
Amer. J. Bot., 1945, **32**: 669-71.
Stem tips of diploid and tetraploid green cabbage were found to contain 14 to 20 times as much auxin as the leaves, per gram dry weight of tissue. Diploids yield two or three times as much auxin as tetraploids; this wide difference bore no relation to nitrogen in the tissue.

1752. De Ropp, R. S. 577.17
Penicillin as a plant hormone.
Nature, 1946, **158**: 555.
Commercial penicillin was found to cause cambial proliferation and abundant root production in sunflower stem tissue cultured on an agar medium. The effect was due to the presence of indoleacetic acid in the commercial preparation. Pure penicillin did not inhibit tissue growth or affect it in any other way.

1753. Jeffers, W. F. 581.14: 632.952
Investigations on the possible growth regulating effect of several fungicides.
Abstr. in *Phytopathology*, 1946, **36**: 686.
The possibility that some fungicides have a stimulating effect on plant growth was tested on bean plants. Spergon was the only material tested which, when applied either in lanolin or Carbowax 1,500 to the stems, consistently gave positive curvatures. Pieces of sweet potato were dipped in Spergon and in water and incubated for 9 days at room temperature; Spergon stimulated root growth and cell proliferation.

1754. Brain, E. D. 631.531: 577.17
Growth inhibiting action of urine extract on seedlings.
Ann. Bot. Lond., 1946, **10**: 195-202, bibl. 10.
Urine extract (H 11), β-indoleacetic acid and its sodium salt, and certain anthraquinone derivatives, applied to cut epicotyls of *Pisum sativum* and *Vicia faba* were found to cause inhibition of side shoot growth and swelling in the cut stems. Apart from the finding that members of the quinone series can inhibit the growth of side shoots, the principal result obtained in these experiments is a confirmation of Borgström's statement, viz. that the swelling of the stem caused by concentrated solution of β-indoleacetic acid is independent of the inhibition effect on lateral buds.

Nutrition and environment.

1755. Roberts, R. H., and Struckmeyer, B. E. 631.541.11/12
The effect of top environment and flowering upon top-root ratios.
Plant Physiol., 1946, **21**: 332-44, bibl. 14.
The ultimate conclusion drawn from experiments with 29 plant species or varieties grown in long and short photoperiods is that a measurement of the top-root ratio would not substantially help to solve the problem of the role or efficiency of roots in plant growth. Apparently, root production is largely determined by the composition a amount of reserve materials within the top, the top-ro ratio being uniformly larger in plants of a species th comes into flower.—University of Wisconsin.

1756. Appleman, C. O., and Brown, R. G. 581.12
Relations of anaerobic to aerobic respiration in some storage organs with special reference to the Pasteur effect in higher plants.
Amer. J. Bot., 1946, **33**: 170-81.
The Pasteur effect (the inhibition effect of oxygen) is phenomenon present in all living cells able to ferment a oxidize carbohydrates. It is the basis for F. F. Blackma theory of oxidative anabolism in his general scheme of t respiratory process in higher plants. The present pap records tests of the effect on a number of storage orga chiefly vegetables, under a wide variety of circumstanc it was found to be very pronounced in carrot and parsn roots and in McCormick potatoes. In some cases t quantity of CO_2 liberated by carrot and parsnip roots nitrogen was nearly twice that liberated in air.

1757. Beeson, K. C. 631.8: 581.192
The effect of mineral supply on the mineral concentration and nutritional quality of plants.
Bot. Rev., 1946, **12**: 424-55, bibl. 124.
The mineral composition of plants depends on many facto that overlap in their effects or work simultaneously. The factors are reviewed under the following headings: eff of fertilization on the phosphorus concentration in plan effect of fertilization on the calcium content of plan effect of micronutrients on the mineral composition plants; effect of fertilization on the quality of forages measured in terms of animal growth and health. W regard to micronutrients the author summarizes as follow The number of soil experiments in which the micronutrie have been studied are too few to permit any generalizatio as to their influence on the general composition of the pla The data available suggest some important interactio and these are supported by the work in solution cultur It is generally true that applications of boron, cob copper and manganese result in greatly increased absorpti of these elements by the plant. There is some evidence th liming practices and intensive fertilization under conditio of a limited supply of micronutrients such as bor manganese, iron and cobalt may further reduce the amo of these elements in the plant.

1758. Virtanen, A. I., and Linkola, H. 631.84
Organic nitrogen compounds as nitrogen nutrition for higher plants.
Nature, 1946, **158**: 515, bibl. 4.
Tabulated data are presented on Torsdag pea grown different N nutrition in sterile water cultures. The auth conclude: "In the light of our laboratory experime especially the new ones regarding the favourable competit of some amino-acids with nitrate and ammonia nitrog it seems probable to us that in natural conditions plants also organic nitrogen compounds for their nitrogen nutriti at least in certain soils. As a rule, however, the uptake organic nitrogen by cultivated plants is not great, si ammonium salts and nitrates are rapidly formed fr organic nitrogen compounds in soil. Since, however, uptake of organic nitrogen compounds even in sm amounts may affect the plants markedly, the significanc these nitrogen compounds can be great. In the foregoi alanine has been noted to cause pronounced changes in shape of pea, and phenyl ethylamine, the decarboxylat product of phenylalanine, which has been added to nitra containing nutrient solution, has produced a branching different type in pea. Effects of this kind can be expec to occur under certain conditions also in Nature."—F chemical Institute, Helsinki.

59. LEHR, J. J. 631.811.9: 546.27
De betekenis van borium voor de plant.* (**The significance of boron for plants.**)
Thesis, Univ. Utrecht, 1940, 193 pp., bibl. 106+ 73. N. V. Drukkerij V/H L. E. Bosch & Zoon, Utrecht.

is thesis consists of two parts. I. The absorption of ron and its distribution to the various organs of *Sinapis a*. II. The significance of boron in agriculture. Part I 8 chapters dealing with 1. Review of literature; 2. The uracy of cultural trials; 3. Methods; 4. The boron uirements of certain crops; 5. The absorption of boron the plant; 6. The distribution of boron within the plant; The role of boron in the plant; 8. Summary and conclu- ns. Chapters 4, 5 and 6 have summary headings. t II discusses 1. Boron reserves in Dutch soils; 2. Boron nomics of the soil; 3. Boron and agricultural crops; Boron and manuring. It ends with a summary of 5 pages English.

60. COLWELL, W. E. 632.19: 546.27
Intensified cropping to diagnose mineral element deficiencies, a method to determine relative boron contents of soil.
Soil Sci., 1946, **62**: 43-9, bibl. 4.
method for determining the relative boron contents of l is described. Five sunflower plants were grown in b. of soil, and the criterion of the boron status of the soil s the age of the culture when the initial symptoms of ron deficiency on the sunflowers appeared. This age referred to as the "age value". It was found to be oducible in different aliquots of the same medium and able of detecting an initial addition of 9·γ of boron in pound of sand. Applicability of the procedure was died by determining the age values of a large number of ls, of known boron status, from field experimentation. rticular attention was given to soils under alfalfa, but ls from apple orchards were also included. An excellent relation was obtained between age values of the orchard ples and boron deficiency records on the apples. [From hor's summary.]

61. PARKER, M. W. 581.02
Environmental factors and their control in plant experiments.
Soil Sci., 1946, **62**: 109-19, bibl. 15.
the various environmental factors that affect the growth plants in greenhouses, the light duration, or photoperiod, such conditions of the soil as temperature, moisture, ation, reaction, and nutrients, can readily be controlled. factors of air temperature, humidity, and composition the most difficult to control because of the constantly widely changing outside environment. If these factors to be controlled within a narrow range, air conditioning a greenhouse or construction of controlled-environ- ital rooms is necessary. The author reviews various s of culture rooms designed and used at a number of arch institutions in the United States, for use in studying environmental factors. Installations need not be ssively elaborate or costly; they can be constructed maintained at a cost within reach of many institutions.

62. BORTHWICK, H. A. 632.19: 612.014.44
Photoperiodic response as a factor in choice of plants for testing soil deficiencies.
Soil Sci., 1946, **62**: 99-107, bibl. 7.
nitions are given of photoperiods, dark periods, long-day ts, critical photoperiod, short-day plants, and inter- iate plants. The author discusses the choice of variety means of avoiding seasonal variability, regulation of th by artificial control of photoperiod, and methods equipment for control of photoperiod.

Translation of parts of this will shortly be available from Bureau.

1763. GUREWITSCH, A. A. 581.13
On the reduction of ortho-dinitrobenzene in green plants. On the mechanism of photosynthesis.
C.R. Acad. Sci. U.R.S.S., 1945, **47**: 646-8, bibl. 17.
Experiments in which the reduction of ortho-dinitrobenzene to ortho-nitraniline in green leaves exposed to light proceeded in a medium freed from carbon dioxide, have shown this photochemical process to take place in green plants independently of the assimilation of carbon dioxide. Hence: (1) The chloroplasts are not only organs of assimilation of carbon dioxide, but also centres of other reduction processes taking place in a vegetable cell, under direct participation of light energy. (2) The assimilation of carbon dioxide in green plastids, as well as many other reduction processes, that take place in the chloroplasts under the influence of light, is brought about under participation of the hydrogen activated in the course of the photochemical reaction. [Author's conclusions.]—Timirjazev Agricultural Academy, Moscow.

1764. BEESON, C. F. C. 581.057: 581.14
The moon and plant growth.
Nature, 1946, **158**: 572-3, bibl. 23.
Reviewing the literature on the subject of lunar influence upon plant growth the author finds only one modern worker, Kolisko, who offers experimental evidence that the phase of the moon affects the germination of horticultural crops. The most favourable sowing date, according to this source, is two days before full moon. Most workers agree "that no consistent effect of the moon is observable and that all chance variations possibly assignable to any of the moon's quarters are evened out with an adequate number of repetitions". There are definite indications that the moon has no substantial influence on such processes as timber seasoning, or the production of resin, latex, gums, etc. A more detailed review will shortly be published by the Imperial Forestry Bureau, Oxford.

1765. TYDEMAN, H. M., AND PRESTON, A. P. 551.5(42)
Weather conditions during 1945.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 76-8.
The first half of the year was drier than the average and sunshine was unusually plentiful during that period. It was an early flowering season for all varieties of fruit. Although there were several ground frosts of moderate severity and a short period of very wintry weather towards the end of the apple flowering season, there was only minor damage to strawberry flowers and excellent crops of all fruits were harvested at East Malling, although widespread damage was reported from other areas. The total rainfall for the year (22·91 inches) was considerably below the 30 years' average; the only outstandingly wet month was December, while November was exceptionally dry. A diagram shows the weather recorded during the blossoming season of 1945.

1766. HEWITT, E. J. 631.415.1
The resolution of the factors in soil acidity. Progress report 1. Season 1945.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 51-60, bibl. 16.
Observations indicate that factors other than calcium deficiency and low pH are responsible for many so-called "acidity" effects in the field. Among those which need consideration are:—(1) direct low pH effects, (2) indirect low pH effects in soil resulting in changes of availability of certain elements, (3) low calcium status—hence calcium deficiency, (4) generally low base status, (5) biotic factors, (6) molybdenum deficiency. The author summarizes his results as follows:—(1) A preliminary sand culture experiment with cauliflower and runner bean was set up to elucidate some of the problems of soil acidity and a series

of crops was also grown in an acid soil in pots for purposes of comparison. (2) The typical symptoms produced in these crops in acid soils were reproduced in sand culture by supplying manganese at 12-25 p.p.m. with a low calcium level. These two crops showed widely differing types of symptom for identical treatments. (3) Increasing calcium supply reduced the severity of manganese toxicity symptoms and also reduced the accumulation of " soluble " manganese as shown by tissue tests on the petioles. (4) Attempts to produce aluminium toxicity resulted in the appearance of symptoms suggestive of low phosphate status in the runner bean but not in the cauliflower. (5) Calcium level had an effect on aluminium accumulation early in the season which was similar to that on manganese. Aluminium accumulation was, however, very slight and the extractable aluminium was not detectable late in the season at a time when the resemblance to phosphorus deficiency in the beans was most marked. (6) The effects of excess manganese differed from those reported for other plants in culture solutions, where iron chlorosis has been induced, and it is suggested that the symptoms may be direct toxicity effects. (7) The crops in the acid soil showed a variety of deficiency symptoms, including those of nitrogen, phosphorus, calcium, magnesium and potassium; tissue tests showed that excess manganese had been accumulated.

1767. LENGLEN, —. 631.821
Le problème des amendements calcaires. **(Improving the soil by liming.)**
C.R. Acad. Agric. Fr., 1946, **32**: 447-68.
This is a dissertation, mostly historical, on the use and abuse of lime in agriculture, with particular reference to the increased production of lime for agricultural purposes in France during the nineteenth century and its decline about 1880 due to two causes: (1) its excessive use, with deleterious effect, during previous decades, and (2) the appearance on the market of inorganic chemical manures. It includes a plea for a more extensive investigation of the lime requirement of soils and for a rational use of lime in relation to artificial manures. It bears mostly on agriculture proper rather than horticulture, but a reference is made to market gardening where frequent irrigation and the use of artificial manures tend to decalcification and acidification of the soil, and make liming necessary.

Various.

1768. LOZA, G. 63: 371.2/3(47)
The organization of the curriculum at the Timirjazev Agricultural Academy. [Russian.]
Soc. Seljsk. Hoz. (Socialist Agriculture), No. 10, 1945, pp. 57-60.
Six teaching and six research establishments belonging to the Academy are described. Work is in progress in all branches of agriculture, including horticulture, animal husbandry, and the cultivation of forage crops.

1769. TRASKE, C. G. 631.462(52)
Notes from Japan.
Gdnrs' Chron., 1946, **120**: 162-3.
These brief notes on a journey through Japan contain the interesting observation that vegetables and rice were doing very well on the bombed sites of Hiroshima, but that weeds were noticeably absent. Soil sterilization by atomic energy! [But see John Hersey's *Hiroshima*, Penguin Edition, 1946, p. 93, in which attention is drawn to lush weed growth about 5 weeks after the event. Ed.]

1770. SMITH, E. L., GREENE, R. D., AND BARTNER, E. 631.531: 581.192
Amino acid composition of seed globulins.
J. biol. Chem., 1946, **164**: 159-65, bibl. 22.
The crystalline seed globulins of hemp (edestin), tobacco, squash, pumpkin, water melon and cucumber have been analysed for leucine, phenylalanine and valine by mic biological assay.

Noted.

1771. BORDEN, R. J. 581.084.1
a **Modified Mitscherlich method for soil cultures.**
Soil Sci., 1946, **62**: 51-60.

b EDEN, T. 631.45
Recent views on soil fertility.
Tea Quart., 1946, **18**: 15-9.

c FINNEY, D. J. 519: 63
Recent developments in the design of field experiments. I. Split-plot confounding. II. Unbalanced split-plot confounding. III. Fractional replication.
J. agric. Sci., 1946, **36**: 56-62, bibl. 5; **36**: 63-8, bibl. 3; **36**: 184-91, bibl. 5.

d LEES, H. 631.453: 631.46
Effect of copper enzyme poisons on soil nitrification.
Nature, 1946, **158**: 97, bibl. 3.

e MCGEORGE, W. T. 581.084.1
Modified Neubauer method for soil cultures.
Soil Sci., 1946, **62**: 61-70, bibl. 6.

f MAKI, T. E., AND MARSHALL, H. 577.17: 631.531.17
Effects of soaking with indolebutyric acid on root development and survival of tree seedlings.
Bot. Gaz., 1945, **107**: 268-76, bibl. 14.
Material: eastern red oak and loblolly pine.

g MAKI, T. E., MARSHALL, H., AND OSTROM, C. E.
Effects of naphthaleneacetic-acid sprays on the development and drought resistance of pine seedlings.
Bot. Gaz., 1946, **107**: 297-312, bibl. 18.

h MATTHEWS, J. R. 581.9(42)
Plant life in Britain: its origin and distribution.
J. roy. hort. Soc., 1946, **71**: 225-39, 259-73.

i MONSELISE, S. P. 634.3: 577.17
On a modification of the oat cylinder test for growth substances used to show the presence of auxin in growing citrus shoots.
Palestine J. Bot. (R.), 1945, **5**: 106-11, bibl. 7.

j MURRAY, M. A. 581.4: 589.514
Carpellary and placental structure in the *Solanaceae*.
Bot. Gaz., 1945, **107**: 243-60, bibl. 25, being *Contr. Hull bot. Lab.* **570**.

k STILES, W., AND DENT, K. W. 581.192: 631.811.9: 546.711
The salt relations of plant tissues. III. Further observations on the absorption of manganese chloride by storage tissue.
Ann. Bot. Lond., 1946, **10**: 203-22, bibl. 21.

l TWYMAN, E. S. 631.811.9: 546.72: 543.711
The iron-manganese balance and its effect on the growth and development of plants.
New Phytol., 1946, **45**: 18-24, bibl. 29.
A review.

m WILCOXON, F. 519: 63
Individual comparisons of grouped data by ranking methods.
J. econ. Ent., 1946, **39**: 269-70, bibl. 2.

TREE FRUITS, DECIDUOUS.

General.

72. WALLACE, T. 634.1/7+664.85+664.84
Long Ashton Research Station.
Farming, 1946, **1**: 77-82.
he history of this famous English station since its original rmation as the National Fruit and Cider Institute in 1903 briefly set out. The main subjects of its research have en fruit culture in general, the control of insect pests and ngoid and other diseases and cider and other fruit products. vestigations on a smaller scale have concerned domestic eservation of fruit and vegetables, willow growing and the ilization of basket willows, and diseases of hops. As a sult of the war a special unit concerned itself with nutri- onal problems of agricultural and horticultural crops. is not possible in such a short article to do more than ck out one or two of the more interesting research items each field, but this is done very successfully and the ader is left asking for more. [Which incidentally he can t from the annual reports of the station.]—Long Ashton, ar Bristol.

773. RUDNICKIJ, H. V. (Editor). 634.1/7
The culture of small and top fruit. [Russian.]
Kirov Province Printing Office, Kirov, 1940, 104 pp., 3.30 roubles. [Received Aug. 1946.]
fter an introductory chapter by the Editor outlining the ork of the Kirov Fruit Research Station, other chapters e written by various authors on special aspects of the ork, i.e. (1) An investigation of the fruit plantations of the irov province, (2) Apple seedlings in the province, (3) pple varieties and breeding, (4) Fruit field trials, (5) Breed- g and variety testing of small fruits, (6) The propagating ursery, (7) The connexion between fruit production and e collective farms.

774. DMITRIEV, L. E., AND SAMČIK, P. A. 634.1/7
Cultivation of tree and small fruits. [Russian.]
Saratov Fruit Veg. Res. Sta., 1936, 124 pp., 22 figs., bibl. 20. [Received Aug. 1946.]
he subject is treated under the following headings: (1) the uit-tree nursery (with special reference to rootstocks and rafted seedlings), (2) the lay-out of a fruit plantation, 3) treatment of the young trees, (4) treatment of the fruiting lantation, (5) the restoration of unprofitable plantations, 5) the cultivation of small fruits (including propagation, ultivation, manuring, standardization), (7) fruit picking, 8) mechanization and rationalization of fruit-tree cultiva- on. An appendix gives a list of 36 nurseries, and the aterial they raise, in the Saratov region.

775. VERCIER, J. 634.1/7
Comment estimer la valeur d'un arbre fruitier. **(How to estimate the value of a fruit tree.)**
Prog. agric. vitic., 1946, **125**: 18-21.
he life of a tree comprises four periods, (1) unproductive ears, (2) years of increasing yield, (3) period of full produc- ion, (4) period of degeneration. These periods are dis- ussed for various kinds of fruit trees with reference to the conomic aspects.

776. SALJE, S. E. 634.1/7
Om övertro och vidskepelse i samband med fruktodling i gångna tider. **(Ancient superstitions connected with fruit growing.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 177-9.
or instance:—Cut your scion at new moon from branches rowing eastward. Other prescriptions tell us how to grow herries without stones, red apples and good-flavoured fruit, ow to control what we call to-day pre-harvest drop, and ow to keep grubs away from the trees.

1777. SKARD, O. 63(481)
Norsk hagebruk, framgang fra 1900-1939. **(Norwegian agriculture 1900-1939.)** [Norwegian.]
Sver. pomol. Fören. Årsskr., 1945, **46**: 35-51.
Agricultural development in Norway during the first four decades of this century has been considerable. Fruit trees, for instance, increased from 1·7 million in 1900 to 3·8 million in 1939, but the number of fruit trees per head of the population is still lower than that of Sweden and Denmark. Of the 51 million kg. top fruit produced in 1939 about one-half were apples. Fifteen million kg. of black and red currants were harvested from 4·4 million bushes in 1939, and commercial strawberry and raspberry plantings yielded another 4·6 million kg. The area devoted to vegetables increased from 700 hectares, inclusive of turnips, in 1907, to 3,200 hectares, exclusive of turnips, in 1939, not counting back gardens. Likewise, the production of flowers and glasshouse crops, especially tomatoes, shows a marked upward trend, the area under glass having increased from 45 to 85·6 hectares during the period 1929-1939. Fruit and vegetable imports, however, are still considerable. Production figures per head of the population in different regions show that horticultural activities are practically limited to the south, west and south-eastern parts of Norway, while northern Norway has to rely almost entirely on transported goods and some wild berries. It is suggested that conditions in the counties of Møre and Trøndelag are sufficiently favourable to allow of increased soft and pome fruit production. Suggestions for a future research programme include glasshouse investigations with particular reference to the utilization of electricity for artificial illumination, and a study of storage and processing problems.

1778. NILSSON, F. 634.1/7(485)
Fruktodlingens lage och utvecklingsmöjligheter. **(Position and prospects of fruit growing in Sweden.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 269-79, bibl. 2.
This survey covers largely the same ground as the author's article in *Quart. Rev. Skandinav. Banken statist. Depart.*, 1946, 27: 16-22; *H.A.*, 16: 1268.

1779. PERSSON-FERLENIUS, G. R. 634.1/7(485)
Skånsk fruktodling. **(Fruit growing in the Swedish province of Skåne.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 137-64.
A survey of the different areas of the Swedish fruitgrowing province of Skåne is made. Of the present total number of 479,779 fruit trees, 50·6% are under 5 years old. Harvest figures are calculated for 1953.

1780. GRANLUND, R. 634.1/7(485)
Sörmlands fruktodling. **(Fruitgrowing in the Swedish province of Sörmland.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 180-94.
The province of Sörmland is outstanding with regard to the large number of old manor house gardens, in many cases containing very old fruit trees. A census of 1937 gives the number of fruit trees in the province as 421,385, i.e. 222 for 100 inhabitants. By 1943 the figure was reduced to 353,178, of which 41,820 trees were under 5 years old.

1781. MEURMAN, O. 634.11(471.1)
Resultat av vissa fruktodlingsförsök i Finland. **(Some results obtained in Finnish experiments on apples.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 35-51.
Not until 1923 did the Finnish State take any active interest in the organization of the country's agricultural research. At that time the research station Dickursby near Helsingfors, up to then a Department of the University, was taken over by the Government, and later a number of local research stations were founded or incorporated into the scheme,

including that at Hinnonmäki for top and soft fruit investigations. Another of these originally local stations, that at Yldöis near Åbo, was selected as the central horticultural research station of the country in 1935, but it took some time before its 30 hectares were planted up. During the severe winters of 1940-42, the first followed by drought in the summer, Finland lost about 90% of her fruit trees. Of the over 1,000 experimental trees, chiefly apples, less than 200 survived at Yldöis. At the research station Piikkiö, however, soil management trials with apples had yielded conclusive results before the trees were wiped out. Five treatments were compared on a sandy soil with loam subsoil: fallow, sod, straw mulch, cover cropping with roots and with green fodder [not specified]. Data are presented in respect of trunk diameter increments of 4 varieties from the time of planting in 1932 to 1937 and in respect of yields of standard trees and dwarf trees from 1933 to 1939. The figures are very low for the trees growing in sod, and somewhat lower for the plots intercropped with green fodder than for the rest, The failure of the sod treatment is explained by water deficiency in the critical period. Mulching was found to have the disadvantage that shoot growth was continued too long in autumn, as a result of which the not quite mature wood sustained comparatively heavy frost damage. For an abstract of the trials on planting depth, mentioned next in this paper, which was read at a meeting of the Swedish Pomological Society in 1945, see *H.A.*, 16: 75. The experiments are being repeated elsewhere under different soil conditions. Yield trials with a number of apple varieties, some of them local, were carried out simultaneously at Piikkiö and Hinnonmäki. The results are tabulated. Rootstock trials were initiated on a large scale, but were partly vitiated by the cold. Nevertheless, from a comparison of seven EM rootstocks and one seedling it was clear in 1942 that trees on EM VII had a superior survival percentage to those worked on other rootstocks. EM I and EM XII occupied the second and third place, while seedlings and EM IX imparted the least resistance to their scion varieties. As a result of these trials EM VII is now being largely propagated in Finnish nurseries. Discussing the necessity for rationalization in apple growing, the author reports that in 1941 a committee set up by the Government recommended limitation to 5 summer, 4 autumn and 6 winter varieties, including 4-5 new and hitherto little-known varieties, introduced from Canada, namely Melba, Rupert, Lobo, Linda and Joyce.

1782. Gerritsen, J. D. 634.23(492)
De kersenteelt in de Betuwe. De kersenteelt in nood. **(Cherry growing in Betuwe, and its needs.)**
Tuinbouw, 1946, No. 1, pp. 12-15; No. 2, pp. 5-7.

About half the acreage under cherries in Holland is in the Betuwe district. The variety mostly grown is May Duke (75%) of which there are several forms. Other varieties cultivated are Black Varik, Early Rivers (but less than formerly), Wine Cherry, Double Morello, Beierlander, and local varieties. Cherry growing began in the district as a result of an attempt to make apple orchards (of large standard trees) profitable in their earlier years by interplanting with cherries, particularly May Duke. Three methods of interplanting apples with May Duke cherries are shown diagrammatically. Cherry growing is said to be declining and the causes are discussed. The cost of production is very high in relation to the yield, though the latter, it is thought, could be increased by attention to manuring, to pollinators and the control of pests and diseases. Starlings are said to be a nuisance, and methods of scaring them are mentioned.

1783. Ministry of Agriculture, London. 634.11 +634.13
Apples and pears.
Bull. Minist. Agric. Lond. **133,** 1946, pp. 119, 2s. 6d.

All the talents of the English research stations have combined in preparing this comprehensive manual on apple and pe cultivation in England and the result should be immense useful to both established and prospective grower alik It is profusely illustrated with maps of apple and pe distribution, diagrams of planting and grafting operatio and photographs of natural phenomena or technic processes used in cultivation. Appendices include notes o planting distances, cropping, credit, land tenure, fruit tr washes. The choice of suitable pollinators, the effect thinning and of dehorning and the choice of storage temper ture and atmosphere are set out in tabular form. Separa chapters are devoted to (1) orchard improvement an renovation, and (2) machinery and implements. Othe which are packed tight with information, deal with all oth phases of cultivation including harvesting, storing an marketing. A very cheap half-a-crown's worth.

1784. Hoare, A. H. 634.11 +634.13
Fruit-growing on the farm. I. Apples and pears.
Agriculture, 1946, **53:** 71-6.

Farmers have shown that they have quickly learned how t grow vegetables; in this article they are invited to consid fruit growing as another expansion of their tradition activities. Farmers in southern England would render national service by doing so, because an increase in fru production is desirable and there is not sufficiently suitab situated land on the market for those who want to specializ in fruit growing. Under the right climatic conditions profi are, of course, another incentive. Five to ten acres of fair large bush apple trees on EM I or II or pears on Mallin Quince A are advocated for an average farm.

1785. Hoblyn, T. N. 634.11
The dessert apple plantation of tomorrow.
A.R. East Malling Res. Stat. for 1945, **A29,** 1946, pp. 115-20.

The considerations which should guide the grower of desse apples when planning new plantations are outlined, an discussed under varieties, pollination, system of plantin rootstock, distance of planting permanent trees and inte planting. The bush tree on a 2 ft. 9 in. to 3 ft. stem recommended as the most practicable form of tree for th commercial grower to-day.

1786. Martin, L. R. E. 634.11-1.546
Dwarf pyramid culture.
A.R. East Malling Res. Stat. for 1945, **A29,** 1946, pp. 123-5.

The dwarf pyramid system of growing apples and pears briefly described with notes on site and soil, rootstock planting, pollination, pruning, grassing down, manurin spraying, varieties and thinning. The need is stressed f careful management at all stages of growth if success is be achieved.

1787. Barker, B. T. P., and Burroughs, L. F. 634.11: 663.3
The production of cider fruit on bush trees. Vintage quality trials. Progress report No. 2. 1943 crops. Progress report No. 3. 1944 crops.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 170-8, 178-84.

Results from the 1943 and 1944 crops confirmed those the previous year [for which see *ibid. for 1943*, pp. 124-3 *H.A.*, 15: 1478]. The inferences from the 3 years' tri are discussed in the 3rd report. On each occasion t group of ciders from each individual centre has borne more or less well marked vintage character distinctive f the centre concerned, although subject in a minor degr to seasonal effects. Thus experience on standardiz material of known age confirms the experience of practi cider makers of many generations working with less unifor material. The organoleptic characters of cider from t different centres are particularly noticeable. In respect

is centre influence it may be noted that the bittersweet rieties on the whole tend to show locality influence more arly than sharp or sweet varieties.

these trials of fruit from young trees the respective ıtage characters of the different varieties are on the whole eady showing up very distinctly in the single variety ler tests.

o definite obvious rootstock influence is noticeable. At nes cider from fruit on different rootstocks has shown ıterial differences in character and chemical composition. ıt no regular correlation in respect of these differences has en established and individual features of difference have peared in reverse order, apparently without obvious ason, in different pairs of samples. A possible explana-n may be that the trees are still too immature for rootstock fluence to be noticeably and regularly effective.

ıe results of these trials show that given varieties of good tural vintage quality cider fruit of a very high vintage ade can be produced within 10 years from planting in sh plantation. Crop yields of 5 tons per acre were got the 6th year following planting.

88. VAN CAUWENBERGHE, E. 634.13
L'actualité en arboriculture fruitière intensive. 3. De la culture intensive du poirier et des possibilités d'intensification. **(Intensive pear culture.)**
Fruit belge, 1945, **13**: 101-6.

or the permanent pear plantation under intensive culture, ramid bush trees are recommended, grafted on Quince A, th or without an intermediate, according to the com-tibility of the varieties with quince. Various distances planting and lay-out are discussed. For more rapid oduction cordons are preferable and the lay-out recom-ended is described. Tables are given showing the yields om pear plantations laid out in various ways.

89. KOYDL, S. 634.22
Napredno šljivarstvo (uzgoj sljiva). **(Successful plum growing.)**
Publ. Min. Nat. Educ. Jugoslavia, No. 1329, 1944, 23 pp. " Tipografija " D. D., Zagreb.

is brochure, a general account of plum-growing in goslavia, discusses climate, site and soil, raising and anting the trees, cultural operations (manuring, de-rning, top-grafting), diseases and pests, how to produce tter plums, and gathering the crop.

90. BAGENAL, N. B. 634.22(42)
Recherches sur la culture du prunier en Angle-terre. **(Research on plum culture in England.)**
Fruit belge, 1945, **12**: 86-8, 109-14.

translation in French of the author's article entitled Plum growing in the light of recent research " in *A.R. st Malling for 1940* (*H.A.*, 10: 855).

91. PERSSON-FERLENIUS, G. A. 634.1/8-1.523
Praktiska synpunkter på växtförädlingen av fruktträd. **(Practical aspects of fruit breeding in Sweden.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 92-7.

is is a paper read in 1945 to the recently founded Swedish uit Breeding Society, which has its experimental gardens Balsgård. The author is chiefly concerned with apples, l he speaks of a time 30 years hence, when the annual it consumption in Sweden will have gone up to 50-60 kg. head and the housewife will be very particular with ard to quality. The problems, which the author would apple breeders to have solved by 1975, include the owing: (1) Fluctuations of the apple crop in Sweden uld not exceed 20% of the average crop in any year. In order to be independent of weather conditions during ssom time new varieties should be self-compatible and e light and potent pollen, so that artificial wind pollina-n can be carried out, if necessary. (3) The vegetative parts and the skin of the fruit should contain protective substances against fungus and insect attacks, and the trunk should be repellent to hares. (4) To save labour and to increase frost resistance fruit trees of the future should be grown on their own roots. (5) Well-matured apple seeds of diploid varieties contain about one-third of the total dry substance of the fruit. Few seeds, as in triploid varieties, should be the aim. The skin should be thinner than that of imported fruit. (6) Summer apples should be even earlier than White Transparent and the keeping quality of winter apples should be extended so that there is hardly any gap between apple seasons. Breeders are warned that they should not aim at producing large fruited varieties.

Varieties and breeding.

1792. TYDEMAN, H. M. 634.1/2-1.523
A progress report on breeding work with the tree fruits.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 63-6, bibl. 12.

This is a review of the work carried out at the East Malling Research Station during the past 17 years in raising and testing new apple, pear and plum rootstocks, and scion varieties of apples and pears. Of 800 or more apple rootstocks raised from crosses between the Malling " Paradise " and varieties immune to woolly aphis only 20 have been retained; these have been tentatively grouped into dwarfing, semi-dwarfing, semi-vigorous, vigorous and very vigorous. An interesting series of imported quinces is under trial for rootstocks for pears; they are notably dwarf in the nursery, but root very freely. Attempts to produce improved rootstocks for plums have not yet been outstandingly successful. With reference to new scion varieties of apples it is stated that " The cross between Worcester Pearmain and McIntosh Red has resulted in a high proportion of highly coloured, juicy apples of good flavour and appearance, while the double infusion of Cox's Orange 'blood' involved in the cross between Cox's Orange and Laxton's Superb has been responsible for some seedlings of excellent flavour and quality."

1793. ANON. (IOWA EXPERIMENT STATION). 634.11-1.523(777)
Apple breeding at the Iowa Station.
Rep. agric. Res. Iowa agric. Exp. Stat. 1944/45, 1945, pp. 21-6, bibl. 27.

The extremes of the Iowa climate necessitated the production of improved varieties. In 1882 J. L. Budd introduced a large number of Polish, Russian and Central European varieties, which were tested pretty thoroughly in Iowa and neighbouring States. A generation of testing, however, eliminated most of them except Hibernal which has proved very valuable as an intermediate stock. Of the others Anisim was the female parent of the new variety Joan, a handsome, large, all-red apple of fair quality. Mantet, a Canadian seedling of Tetofsky, is a promising late summer apple. S. A. Beach, who was in charge of horticulture at the Station from 1905 to 1922, made considerable progress, and work initiated by him is still in progress. Outstandingly prepotent parents transmitting high quality and generally red colour have included Jonathan, Delicious and McIntosh. Others proving excellent in some, but not all, combinations are Salome, Harrington, Wolf River and Wealthy. Despite the heterozygous character of the apple certain hardy varieties such as Antonovka and McIntosh were found to transmit hardiness of tree to a large proportion of their seedlings, even when crossed with tender varieties. Acidity and sweet flavours were found to be of mixed origin. Varieties of summer and autumn season, when crossed, produced a predominantly high proportion of early season apples. When late-keeping varieties were crossed, most of the seedlings tended to be late keepers. Among seedlings which have now proved their value are Secor, Sharon,

Hawkeye Greening and Joan. Since the death of Beach the responsibility for the work has fallen on T. J. Maney, H. L. Lantz and B. S. Pickett, the last having been head of the Department of Horticulture since 1923. The bibliography includes 17 technical papers and 12 papers read before horticultural societies.

1794. TYDEMAN, H. M. 634.11-1.523
Two new apple varieties bred at East Malling.
A.R. East Malling Res. Stat. for 1945, **A29,** 1946, pp. 121-2.

Two new varieties of apple are described. Tydeman's Early Worcester (from the cross McIntosh Red×Worcester Pearmain) and Late Cox (Laxton's Superb×Cox's Orange Pippin). Details are given of the manner in which they were tested and selected [*see above* 1792].

1795. OLDÉN, E. J. 634.11-1.523
Några nya högkromosomiga äppletyper. **(Some new high-chromosome apples.)*** [English summary 1 p.]
Sver. pomol. Fören. Årsskr., 1945, **46**: 105-15, bibl. 12.

In the continued investigations [at Balsgård] of seedlings from triploid varieties of apple 5 new tetraploids have been found as well as 3 plants with a higher chromosome number than 68, two of these having 73 and one 76 chromosomes in the somatic cells. All these three high-numbered types of apple are descendants of the triploid variety Ribston. Among seedlings from *Malus sieboldii* 3 plants were found with the chromosome number 85. Chromosome counts undertaken on a number of seedlings from Gravenstein, Mère de Ménage, Ribston, Canadian Reinette and Rött Järnäpple resulted in the finding of 2 new tetraploids from Canadian Reinette, 2 from Rött Järnäpple and 1 from Mère de Ménage. Morphological observations were taken on the new tetraploids as well as the high-numbered aneuploids. A definite difference in the stomatic cells was noted between triploids and tetraploids, a less definite one between triploids and high chromosomal aneuploids. Measurements of leaf-thickness revealed a distinct difference between diploids and plants with higher chromosome numbers. The difference is less distinct between triploids and tetraploids as well as high chromosomal aneuploids. [From author's summary.] Scab and mildew (*Podosphaera leucotricha*) resistance of tetraploids seems to be promising. Only some of the new types showed slight leaf symptoms of scab, while no incidence of mildew occurred. This is remarkable in view of the large stomata characteristic of tetraploids, which favour the entry of the fungus. Unfortunately, the resistance shown to diseases does not extend to red spider.

1796. MEURMAN, O. 634.11-1.521
Några uppgifter över kanadensiska äpplesorter i Finland. **(Canadian apple varieties in Finland.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 123-34.

The experimental introduction of Canadian apple varieties has led to the official recommendation of the following 5 varieties for increased propagation in Finnish nurseries: Melba, Rupert, Lobo, Linda and Joyce. Growth habit, fruit and other characteristics of these varieties are described and pictured.

1797. HÜLPHERS, A. 634.11-1.521
Uvereds-äpplet. **(The Swedish apple variety Uveredsäpple.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 135-6.

Apparently, all trees of the local apple variety Uveredsäpple survived the severe winters of 1940-1942 in Sweden. In addition to hardiness this variety has other valuable characters to recommend it: It is scab-resistant, prolific, fairly early and a good keeper (November-December). Its taste is satisfactory. The reworking of unsuitable varieties to Uveredsäpple is advocated.

* See *Ibidem*, 1942, 43: 25-8 and 1944, 45: 229-37; *H.A.* 13: 718 and 15: 449.

1798. CORNET, J. 634.13-1.523
Une poire inconnue en Belgique, la " Duchesse Beret ". **(A pear unknown in Belgium.)**
Courr. hort., 1945, 7: 161.

The Duchesse Beret, raised from a pip of Duchesse d'Angoulême, is a pear already on the market in Switzerland and said to be worth notice. The tree is vigorous and not ve subject to diseases and pests, it grows evenly and is suitab for pyramids. Its fruit is considered to have the commerc value and as good a flavour as Doyenné du Comice, but be more fertile. A brief description of the fruit is given.

1799. MARKOV, N. V. 634.22
The plums of Alma-Ata. [Russian.]
Kazak Agricultural Research Institute, Kazgosizdat, Alma-Ata, 1940, 44 pp., 17 figs. [Received Aug. 1946.]

An account of plum-growing in and around Alma A (in the Autonomous Kazak S.S.R.), with descriptions the varieties grown there. They include such varieties Victoria, Giant Prune, Greengage, Transparent Ga and Yellow Egg, as well as two locally raised varieties.

1800. JENSEN, H. 634.22-1.523
Växtförädling av plommon. **(Plum breeding.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 98-104.

The *Prunus* species, which may serve as material for breeder, and their distribution is discussed. The ori of our European plum from an accidental cross betwe *P. cerasifera* and *P. spinosa* somewhere in southern Euro or Asia Minor explains its lack of hardiness. The probl of producing a hardy plum of the 48-chromosome type m be approached by the breeder in different ways. T following suggestions are made: (1) by crossing a hard large-fruited type of the Swedish sloe (32 chromosom with the best and hardiest varieties of the 16-chromoso species, in the hope of obtaining a new 48-chromoso type; (2) by treating 16-chromosome species with colchic and crossing the possibly resulting 32-chromosome prod with other 16-chromosome species; (3) by imparting hardiness of *P. besseyi* to the 48-chromosome *domes* type. Such hybrids are already in existence thanks N. E. Hansen's breeding work at the South Dakota Exp ment Station.

1801. MINISTRY OF AGRICULTURE, LONDON (GARNER, R. J., SWARBRICK, T., AND MONTGOMERY, H. B. S.). 634.1/2-1.532/541
Fruit tree raising—rootstocks and propagation.
Bull. Minist. Agric. Lond. **135,** 1946, pp. 46, 1s. 3d.

The technique of fruit tree raising as recommended English experts is here set out in great detail. In the chapter the characteristics of the particular rootsto recommended for apples, pears, plums and allied fruits cherries are discussed. Then the process of raising fr seed is described and this is followed by the technique raising stocks vegetatively in the stool- or layer-bed or cuttings. The actual operations of budding and graf and of double working are detailed. The impor subject of pruning and shaping in the nursery is discus and a short chapter is devoted to the production of stand trees for farm orchards. The control of nursery pests diseases is considered and notes are given on the prepara of sprays. There are useful appendices of practical infor tion on such subjects as the certification of rootsto Finally a clear cultivation and spraying calendar is inclu for the use of the fruit tree raiser.

1802. FLOOR, J. 634.1/2-1.541.11
De onderstammenteelt in Engeland. **(Rootstock propagation in England.)**
Tuinbouw, 1946, No. 3, pp. 19-20, bibl. 6.

An account for Dutch readers of recent work carried at the East Malling Research Station on apple rootsto with reference to the production of rootstocks immun

olly aphis and to the anatomical comparison of varieties rootstocks.

03. BRYNER, W. 634.22-1.541.11
Zur Wahl des Saatgutes für die Anzucht von Pflaumen und Zwetschgenunterlagen. **(Seed selection for the raising of plum and zwetschen rootstocks.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 332-3.
ie partial interruption of rootstock imports during the ar made Swiss nurserymen conscious of their dependence n foreign supplies and of their own lack of experience. consequence, seedlings from plum and zwetschen varieties id from other material were raised to study their suitability rootstocks. The report covers only the preliminary age, which led to the concentration on a limited number varieties and other material for further investigation. is, of course, too early to make any statements on the fect of rootstocks on scion varieties.

04. GARNER, R. J. 631.541.11: 634.11 +634.22
The recognition of some apple and plum rootstocks in the nursery.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, p. 130.
notographs and brief descriptions are given to enable the rseryman to recognize the principal apple and plum otstocks in the field.

05. HENKES, H. J. M. 634.22-1.541.11
Handleiding voor de determinatie van pruimen-onderstammen.* **(The identification of plum rootstocks.)**
Meded. LandbHoogesch., Wageningen **38**, 1943, 46 pp., 22 plates, Nederlandsche Algemeene Keuringsdienst voor Boomkweekerijgewassen (N.A.K.—B.).
ie purpose of this manual, which is on the same lines as at produced by Floor and Zweede for apple rootstocks ee *H.A.*, 7: 523), is to enable horticulturists and nursery-en to identify the varieties of *Prunus* used as rootstocks, om the characters of the shoots and leaves in summer, d from the shoots and buds in winter. The first chapter a historical outline of the classification of plum root-ocks with particular reference to the work at the East alling Research Station, and, more recently, at Wagen-gen. The author recognizes four groups, i.e. (1) vigorous Brompton, Pershore and the Myrobolan types, (2) semi-gorous—Brussels and the various St. Julien, Black Damas d Mussel types, (3) semi-weak—Kroosjespruim, Common um, (4) weak—Mariana. Chapter II describes the entification according to the summer characters with an planation of terms used, the characters being those of the rk (colour, hairiness) and leaves (form, petiole, margin, , glands, stipules). Photographic illustrations indicate e meaning of some of the terms and a key is given for the termination of the various plum rootstock varieties in lation to those terms. Chapter III, along similar lines, ows how the varieties can be identified in winter according the characters of the bark (colour, hairiness), buds (form, se, secondary buds), leaf scar (size, shape, inclination), f base (strongly or weakly developed), and a key for use th these winter characters is given. In Chapter IV, plum varieties are described in detail, each being illus-ated by photographs showing the general appearance of e shoot, the leaf for summer characters, and portions of oots in winter to show particularly the buds and leaf bases.

06. SPINKS, G. T. 634.11-1.541.11
Trials of clonal apple rootstocks selected from "free" and "crab" seedlings. III. Performance on a number of sites in the west of England when worked with several scion varieties.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 19-43, bibl. 3.

* Translation into English of certain sections is being carried t.

Previous articles dealing with the performance of different apple varieties worked on selected clonal seedling or crab rootstocks have appeared in *J. Pomol.*, 18: 226-38 and 18: 239-48 (*H.A.*, 10: 1315, 1316). The scion varieties used in the present trial were Worcester Pearmain, James Grieve, Laxton's Superb, Lane's Prince Albert, Cox's Orange Pippin, Bramley's Seedling, Newton Wonder, Blenheim Orange and Kingston Black, and the rootstocks 15 selections with the two East Malling selected stocks, EM II and EM XII, for comparison. The trials were carried out at Long Ashton and a number of other places in the west of England under conditions of recording made peculiarly difficult as the result of wartime labour scarcity. The various trial plots are discussed separately and notes are given of soils, sites and cultivation. In some trials the trees were bushes, in others full standards. They varied in age, the oldest being 18 years from time of planting. Root-stocks associated with the heaviest crops include those designated as E7, E8, F11, G7, EM II, G8, and EM XII. With the first five of these cropping began early and was heavy relative to size of tree. Full bearing was slightly delayed on G8, and more markedly so on EM XII. EM XII was associated with the largest tree and G8 with slightly smaller ones, while trees on E7 and G7 were similar in size to those on EM II. E8 and F11 had a semi-dwarfing effect. Two other stocks, A10 and D1, were found to be incom-patible with some of the scion varieties. It is suggested that E8 and F11 may be of value as semi-dwarfing and E7 and G7 as more vigorous and G8 as a still more vigorous stock, the last three as rootstocks for standard trees. None of the other stocks appears to be worthy of further trial.

1807. GARNER, R. J. 634.11-1.541.11
The rootstock Malling Crab C.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 126-9.
The origin and selection of the apple rootstock Malling Crab C are described. The vigour and cropping, over 25 years, of four commercial varieties (Allington Pippin, Grenadier, Lord Derby and Lane's Prince Albert) worked on it, prove it has merits in advance of the better known vigorous rootstocks. In the nursery it grows with a clean stem but roots shyly in the layer bed. Root cuttings have proved a ready means of propagation and the method is described.

1808. THOMAS, L. A. 634.11-1.541.11
Stock and scion investigations. V. A nursery trial with apple rootstocks.
J. Coun. sci. industr. Res. Aust., 1945, **18**: 349-54, bibl. 3.
In a nursery trial, in which Jonathan was used as the scion variety, the following apple rootstocks were compared: EM XVI, Merton No. 789 and 793, Northern Spy and two local selections. Merton No. 789 and 793, the result of crossing EM II with Northern Spy, are immune to woolly aphis. The results show that No. 793 induced the greatest vigour, followed by EM XVI, No. 789, the two local stocks and Northern Spy, and that for the period 1937-44, during which the first 4 crops were produced, the trees on the two Merton stocks yielded about twice as much as those on EM XVI and Northern Spy, the crops of the two local selections comparing still less favourably. It is thought that the good performance of No. 789 and 793 combined with their immunity to woolly aphis will lead to their wide propagation in the southern hemisphere in place of Northern Spy. Data on growth, blossoming and rooting habits are also presented.

1809. BEAKBANE, A. B., AND MARTIN, L. R. E. 634.11-1.541.11
The intensive culture of hardy fruit trees. II. A trial of dwarf pyramid trees on Malling root-stocks.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 45-8, bibl. 10.
In continuation of former work on the intensive culture of

hardy fruit trees (see *H.A.*, 15: 467) the present article describes a trial of Cox's Orange Pippin trees, grown as dwarf pyramids, for studying rootstock influence (Malling Nos. I and XVI), and the effect of pruning by two methods: (1) branch leaders pruned in summer, laterals lightly pruned (referred to as Method L), and (2) branch leaders pruned in winter, laterals more severely pruned (Method S). The rootstocks selected were considered to be the most suitable for intensive cultivation and the trees began to fruit in their second season after planting. When ten years old the trees on M XVI were more than twice as large as those on M I. The trees on M I bore more fruit buds in relation to their size than those on M XVI. There was a suggestion that trees pruned by method L were smaller and more fruitful than those pruned by method S. Comparisons of fruitfulness were based chiefly on fruit buds, because spring frosts destroyed the crop in three years.

1810. VAN CAUWENBERGHE, E. 634.11
L'actualité en culture fruitière intensive. 2. L'intensification en culture commercial de pommiers. Système des temporaires et des permanents. **(Intensive commercial fruit culture. Temporary and permanent systems.)**
Fruit belge, 1945, **12**: 65-9.

When planting an apple orchard of permanent trees with temporary trees between them it is recommended that the distance between the permanent trees should preferably be the maximum so that it will not be necessary to take out the interplanted trees too soon. The distance between the permanent trees should be a minimum of 6 m. and a maximum of 7 m. The vigorous varieties are grafted on rootstock No. II or I and the weak varieties on XIII or XVI. The interplanting is simple when one temporary tree is planted in the centre of four trees; it is double with a temporary tree between each pair of permanents in the line and a line of temporaries between the lines of permanents. In the latter case the distance between the permanents is doubled. The yield of Cox's Orange Pippin apple trees over a period of 13 years is given, the temporary trees being removed at the end of the tenth year.

1811. JOHANSSON, E. 634.1/2-1.541.11
Nyare undersökningar beträffande fruktodling. **(New investigations on fruit growing.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 84-91, bibl. 10.

Three Danish papers on apple, plum and cherry rootstocks, and 7 English and American papers on various pomological subjects are discussed.

1812. LEWIS, D. 581.162.3
Useful X-ray mutations in plants.
Nature, 1946, **158**: 519-20, bibl. 2.

Self-compatible plants have been produced of the normally quite self-incompatible species *Oenothera organensis* by pollinating from flowers which had received an X-ray dose of 500 r. units 37 days previously. Since in self-incompatible species vigour depends on heterozygosity, the production of compatible plants would be no advantage in seed-reproducing crops. In fruit trees, however, self-compatible mutations would be a real benefit. Another field, where X-ray treatment might yield results of practical value, would be the production of dwarf fruit varieties for precocious rootstocks and the production of dwarf pear and cherry rootstocks.—John Innes Horticultural Institution, Merton, London.

1813. BODART, J. 634.1/2-1.541
La greffe en croix ou greffe Swerts 3. **(The cross graft or Swerts 3 graft.)**
Courr. hort., 1945, **7**: 161.

A grafting method for restoring espaliers is described and illustrated. The scion, about 5 internodes long, is cut into a wedge shape at about the middle of its length. A wedge-shaped cut is made in the stem of the tree to be grafted, and the wedge of the scion inserted so that the cambi layers of stock and scion correspond. The graft is secu by a steel or brass nail and the union covered with graft wax.

1814. BODART, J. 634.1/2-1.541
Multiplication des sujets porte-greffes types par la greffe de Coté-Swerts. Une nouvelle methode interessante. **(Swerts' method of propagating rootstocks.)**
Courr. hort., 1945, **7**: 101-2.

Swerts' method of propagating rootstock varieties of f trees is essentially the insertion of grafts near the base the mother tree and covering them with soil to induce development of rooted shoots from the nodes. As soon the bark is easily detachable from the stem, the grou around the base of the mother tree is removed to a de of 10 cm. Triangular or diamond-shaped pieces of b are removed from the collar region and grafts 25 to 50 c long are inserted horizontally in the cuts. When the b begin to swell the grafts are covered to a depth of 3 cm. w a layer of light soil. As the shoots elongate more soil added until the middle of July, after which they are left develop freely. After leaf-fall (in November) the roo shoots are removed as potential rootstocks. The numb of grafts to be attached to the mother tree depends upon size of the latter. On a collar 2·5 cm. in diameter t grafts are inserted, but a collar 5 cm. in diameter will t three or four.

1815. BODART, J. 634.1/2-1.541
Utilisation du bois de taille pour la multiplication des sujets porte-greffes par greffage suivant le "System Swerts". **(Using pruning wood for the propagation of rootstocks by grafting by Swerts' system.)**
Courr. hort., 1946, **8**: 49-50.

Swerts' system is the utilization of the superfluous sap top-grafted trees for the propagation of rootstocks, applying grafts to the roots. Two or three trenches are d round the tree to expose portions of roots in which gra of the desired variety are inserted, the method of graft employed being one suitable to the age of the roots and time of grafting. When the grafted twigs (each bear 3 or 4 buds) come into growth, they are earthed up. part covered with soil begins to root and the buds deve into shoots; the bases of these shoots are covered with s in their turn and they also strike roots. Such shoots m be removed during the winter for use as rootstocks or so of them may be layered.

1816. WOODCOCK, H. D. 634.1/2-1.541
Chinese method of propagating fruit trees.
Gdnrs' Chron., 1946, **120**: 140.

Quoting from *The Annual Register* (1833) the author dra attention to a method of marcotting adopted by the Chin for raising fruit trees on their own roots. A rope of st besmeared with cow dung is wound around a branch of parent tree close to the junction with the trunk until a is formed 5-6 times the diameter of the branch. This b which is intended as a bed for developing roots, is k moist by an ingenious device. Under the ball the bar divided down to the wood for nearly two-thirds of circumference of the branch. After three weeks one-th of the remaining bark is cut off, and the former incisio carried deeper into the wood. After a similar period operation is repeated, and after two months in all r development into the ball is so advanced that the bra may be cut off at the incision and planted as a young tre

1817. NATIVIDADE, J. V. 634.1/2-1.541.44
A sobreenxertia das fruteiras adultas. **(Frameworking fruit trees.)**
Bol. Junta nac. Frut., Lisboa, 1945, **5**: 5/6: 1-15.

An illustrated account of frameworking fruit trees, ba on the work carried out at the East Malling Resea Station.

818. R., H. 634.1/2-1.541.44
Le regreffage des arbres à fruits à noyaux. **(Regrafting stone-fruit trees.)**
Courr. hort., 1945, 7: 77-8.
A short account (with figures) of regrafting plum and cherry trees, with comments on certain combinations that are compatible and others that are to be avoided. Reference is made to the chief characters of the East Malling rootstocks for stone-fruits. As a knowledge of the flowering period of the scion is important, a list is given of plums and cherries classified as early, semi-early, semi-late and late varieties.

819. GARNER, R. J. 634.1/2-1.541
Greffes intermédiaires et en arc-boutant de varietiés de poiriers se soudant mal au cognassier. **(Double-working and bridging incompatible combinations of pear and quince.)**
Courr. hort., 1946, **8**: 188-91.
A translation in French of an article that appeared in the *E.M.R. East Malling Res. Stat. for 1943*, see *H.A.*, 14: 1502.

820. GARNER, R. J. 634.22-1.535
The behaviour of hardwood cuttings of two plum rootstocks on four soils.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 49-53, bibl. 6.
In the two trials described, cuttings were taken from each of two parental sources, ready rooting Myrobolan B (*Prunus cerasifera*) from a mature hedge, and rather shy-rooting Brompton (var. of *P. domestica*) from an established bed. The cuttings, of two grades, were planted on four soils: Malling loam, a dry lake-bed soil, and two types of Bagshot sands, in each of two years. The loam and lake soil gave good results, but the satisfactory performance on the Bagshot sands depended upon choosing a site free from waterlogging. The Myrobolan B rooted well in all except the poorest situations, but the rooting of Brompton proved inadequate. The so-called black sands gave very different results; one at a high level was satisfactory, but at the lower level and rather waterlogged, the Myrobolan B remained extremely small and the Brompton almost died out. The performance of cuttings collected and planted at Bagshot alongside one of the experimental plots (material collected at East Malling) indicated the great importance of source (or internal condition) of cuttings and this merits further investigation.

821. GARNER, R. J. AND HATCHER, E. S. J. 634.22-1.541.11-1.535
Plant Myrobolan cuttings closer to improve their shape.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 131-2.
The plum rootstock Myrobolan B is commercially propagated either by layering or by shoot cuttings taken and planted in the autumn. In general, propagation by cuttings is preferred, but it has the disadvantage that the rootstocks thus raised produce vigorous side branches which entail much work in trimming and are awkward to handle. The experiments described indicate that, to avoid this, shoot cuttings of Myrobolan B should be planted closely, at 3 in. apart in rows across 5 ft. beds at 6 in. intervals. Paths of 15 in. should be left between the beds.

822. VYVYAN, M. C., AND GARNER, R. J. 634.22-1.535
Propagation of fruit tree rootstocks by stem cuttings. IV. Effects of soil conditions on habit of growth in Myrobolan B.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 79-82, bibl. 3.
Rooted hardwood cuttings, from two cutting beds of Myrobolan B, one on normal soil, the other on the drained bed of a lake, were examined by dividing them into " trunk ", branches and roots, and recording, tabulating and analysing the weights. The results obtained show that soil conditions in the cutting bed influence the stem/root ratio and the branchiness of plants grown thereon.

Pollination.

1823. BUTLER, C. G. 638.1
Bee-keeping.
Bull. Minist. Agric. Lond. **9**, 1945, pp. 27, 9d.
This 7th edition of the Ministry's bulletin on bees is entirely new and can be recommended as a most proper foundation for all intending bee-keepers. The author considers in turn:—choice of bees, hives and accessories [a further bulletin on this is promised], position, introduction of bees to hive and initial care, feeding with sugar [the author advises against adding medicaments or preservatives], seasonal management, preparation for and making increase including requeening, uniting of colonies or nuclei, and methods of swarm control with details of both the Demarée and Snelgrove systems.

1824. MINISTRY OF AGRICULTURE, London, (BEE DEP. ROTHAMSTED). 638.15
Diseases of bees.
Bull. Minist. Agric. Lond. **100,*** 1945, pp. 25.
The symptoms of the 4 brood diseases, namely American Foul Brood, European Foul Brood, Chalk Brood and Addled Brood, are described in detail and treatment is recommended for the last two. For the former, complete destruction by fire is the only recommendation at present offered. Other abnormal brood conditions are also considered. Other diseases dealt with are:—(1) Acarine disease. For dealing with this the manipulative method, the Frow treatment and the methyl salicylate treatment are described. (2) Nosema and amoeba diseases. (3) Paralysis in its many forms. (4) Dysentery. (5) Poisoning.

1825. SCHAER, E. 634.11: 581.145.1
Einfluss der Witterung auf Zeit und Dauer der Apfelblüte. **(The influence of the weather on time and duration of the apple blossom.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 311-5.
Time and duration of blossoming of many apple varieties were studied at Wädenswil during the period 1935-46, with the exception of 1938-40. The records show that the order of blossoming of different varieties remains fairly constant, irrespective of whether the blossoming period as a whole is early or late. Generally, there is sufficient overlapping between early and late blooming varieties to allow of pollination, but since just during this period conditions need not be favourable, pollination is guaranteed only between early to medium-late or between medium-early to late blooming varieties. Of the climatic factors studied which might affect the time of apple blossoming, temperature sum and rainfall are undoubtedly the determining influences, while hours of sunshine, number of days with frost, etc., may be neglected. As a result of these findings, it is suggested that in early years every effort should be made to preserve the soil moisture. A delay in blossoming of a few days only may help to make the customary protection measures against spring frost a full success. A table and graphs present the data in summarized form.

Growth and nutrition.

1826. FLECKINGER, J. 634.13: 581.145.1
Notations phénologiques et représentations graphiques du développement des bourgeons floraux du poirier. Leur intérêt comme méthode générale pour les études de biologie et d'écologie. **(Phenological notations and graphs of the floral development of the pear as a general method for studying biology and ecology.)**
Fruit belge, 1946, **14**: 41-54.
The author describes, and illustrates by drawings, nine

* Revised from subject matter formerly included in *Bull.* 9.

stages in the development of pear inflorescences from hibernation to petal fall. He then explains his method of recording these stages and setting them out graphically.

1827. LECRENIER, A. 634.1/7-1.55
La chute prématurée des fruits. **(Premature fruit drop.)**
Fruit belge, 1946, **14**: 37-40, 100.
A general account of the factors conducive to fruit drop, discussing the effect of pollinizers, meteorological conditions and damage by pests, with a brief reference to spraying for the prevention of pre-harvest fruit drop.

1828. PEARSE, H. L. 577.17: 634.11-1.55
Hormone sprays and the control of pre-harvest drop of apples.
Fmg S. Afr., 1946, **21**: 553-60.
Experiments were carried out at Elgin, Cape Province, in 1945-46, to test the effectiveness of hormone sprays against pre-harvest drop of apples and to evaluate the difference in efficacy of commercial preparations on the South African market. The varieties used were Ohenimuri and Rokewood. The treatment was found to control fruit drop successfully under the conditions at Elgin, irrespective of the brand used. The average period of effectiveness of a single spray application appeared to be about 14 days from the time of spraying, or 11 days from the time the spray begins to act, the hormone requiring 3 days to diffuse into the tissues.

1829. SIAENS, F. 577.17: 634.1/2
Les pulvérisations aux phytohormones en arboriculture fruitière. **(Spraying with phytohormones in fruit growing.)**
Courr. hort., 1946, **8**: 92.
This short article briefly outlines the object of pre-harvest spraying of fruit with hormones (naphthaleneacetic acid at 10 mg. per litre is mentioned) and then gives the following advice: Do not spray too early; if the equipment of the orchard permits, delay the application as long as possible for summer and early autumn varieties. Consider the spraying as a means of diminishing the risks of loss at the end of the season. Its use on early varieties to retard the time of picking has an adverse effect on the quality of the fruit; harvest these varieties at the normal time. Leave one or several trees unsprayed for comparison. Do not give a full general spraying to varieties of which you do not know the probable reaction. The author mentions as giving favourable results these pear and apple varieties: Précoce de Trévoux, Clapp's Favourite, Beurré Hardy, Bonne Louise d'Avranches, Jules d'Airoles, Doyenné du Comice, Beurré Clairgeau, Reinette de Landsberg, Wealthy, James Grieve.

1830. ALLEN, F. W., AND DAVEY, A. E.
634.13: 577.17: 664.85.13
Hormone sprays and their effect upon the keeping quality of Bartlett pears—1944.
Fruit Prod. J., 1946, **25**: 370-2.
The use of hormone sprays by the pear growers of California has become standard practice and the experimental results obtained show its effectiveness in reducing the dropping of pears to at least 50% and at certain periods to a very small fraction of that of unsprayed trees. In this connexion rather extensive ripening, storage, and canning tests were carried out in 1944 and 1945. Hormone sprays are effective in reducing premature dropping of Bartlett pears, and their use for this purpose seems fully justified. Watery breakdown of Bartlett pears occurred in fruit from both sprayed and unsprayed trees. Breakdown of the pears from two areas was more severe from sprayed than unsprayed trees. Little breakdown occurs where harvest is completed by midseason and the fruits placed under adequate refrigeration without delay. More rapid ripening and greater loss from breakdown in sprayed pears was noted in numerous lots ripened at the cannery, but no differences in processing the sprayed and unsprayed fruit were evident when samples were c 12 January, 1945.

1831. SCHOMER, H. A., AND MARTH, P. C.
664.85: 632.19: 577.17
Effect of growth-regulating substances on the development of apple scald.
Bot. Gaz., 1945, **107**: 284-90, bibl. 6.
In 1943 and 1944, Arkansas, Stayman Winesap, Grim Golden and York Imperial apples were treated with lanoli emulsions of α-naphthaleneacetic acid, β-indolebutyric ac and a mixture of 4 growth substances at concentrations 10, 100 and 500 p.p.m. The treatment was carried o after harvest and again prior to 31° F. storage, either b dipping the fruit in the emulsion or by the aerosol metho At the end of the storage period it was found that the grow substances, irrespective of the concentration used and t compound applied, had consistently reduced scald compared with the controls, both in severity and with rega to the number of fruits affected. The most marked effe was noted in the Arkansas variety, where the reduction scalded fruits averaged 24%. The dip treatments ga slightly better control than did the aerosols. In view these first successes further studies on scald control b growth substances appear justified.

1832. GERHARDT, F., AND ALLMENDINGER, D. F.
577.17: 634.11 + 634.13 + 634.23
The influence of naphthaleneacetic acid spray on the maturity and storage physiology of apples, pears and sweet cherries.
J. agric. Res., 1946, **73**: 189-206, bibl. 15.
At Wenatchee, Washington, pre-harvest drop of Winesa and Delicious apples and of Bartlett pears was effectivel controlled by spraying with α-naphthaleneacetic acid. Th storage quality of treated fruits was in no way impaire provided the fruits were picked at their normal maturi 1-2 weeks after spraying. However, if harvest was pos poned, losses from breakdown were much more seriou than those occurring in untreated fruits in storage. Th was particularly true of Bartlett pears allowed to hang the trees for an extended period after application. The does not seem to be any justification in a report that shrive ling of the fruits and browning of the stems of Montmoren cherries can be retarded by spraying with the grow substance.

Cultural practice.

1833. FÄSSLER, J. 634.1/7-1.536
Erleichterungen beim Verpflanzen der Obstbäume. **(The transplanting of fruit trees.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 272-5.
The transplanting of fruit trees with the aid of a pulley described and illustrated.

1834. BRYNER, W. 634.1/2-1.546
Das Heften von Tragruten an Zwergobstbäumen. **(The tying-down of the annual growth in dwarf fruit trees.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 291-3.
The tying down of the annual growth of dwarf fruit tre allows the young shoots to be pruned lightly or to be l entirely unpruned with the result that the increased folia will bring about earlier bearing without detriment to t tree. The operation is carried out with raffia bast or w a wire clamp (*ibidem*, 1943, 52: 369-71 and 1945, 54: 55- *H.A.*, 13: 1187 and 15: 1463), with pears in June or at t latest early in July, with apples from July to the end August. Premature tying down causes the tips to grow i vertical direction within a few days, while waiting till af lignification makes the work difficult and increases t danger of breakage, especially in pears. Photographs sh the desirable position of the new growth.

1835. JAIVENOIS, A. 634.1/2-1.546
L'arcure. **(Arching.)**
Courr. hort., 1946, **8**: 47-8, 90-2, 139-40.
The author discusses arching (bending down branches to induce fruiting) in relation to its effect in (1) inducing fruiting on trees that are too vigorous, (2) arresting growth, particularly in espaliers, (3) bringing trees quickly into bearing again after regrafting, (4) getting an early crop from standard trees. Various methods of employing it are described and illustrated.

1836. SAUBLENS, L. 634.1/2-1.546
La palmette double. **(The double palmette.)**
Courr. hort., 1945, **7**: 20.
The double palmette method of training fruit trees is less often seen now than formerly; it is suggested that this is because of the difficulty in packing the tree for despatch from the nursery. It is said to be advantageous both to the commercial grower and to the amateur. The method of training is described in detail and illustrated.

1837. HOBLYN, T. N. 634.13-1.542
A winter pruning trial of pears.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 54-62, bibl. 5.
This is a report on an experiment carried out by the late Mr. J. Amos. Nine varieties of pear were subjected to four differential pruning treatments for 12 years, viz. hard against light leader tipping and few or many branches. The light leader-tipped trees cropped earlier and generally produced more fruit over the whole period, but did not induce very early bearing in a slow cropping variety such as Doyenné du Comice. Trees with a restricted number of branches produced nearly as much blossom as those with many branches and the difference in fruit set was not appreciable. Hard leader tipping did increase fruit set, but not sufficiently to induce early bearing in varieties that normally blossom well, but fail to set fruit. The relative size and shape of trees of Conference, Doyenné du Comice and Durondeau after 11 years' differential pruning are shown by drawings.

1838. FRANÇAIS, I. 634.1/7-1.542
La taille de tous vos arbres fruitiers. **(Pruning fruit trees.)**
Courr. hort., 1942, **6**: 1-5. [Received Aug. 1945.]
Descriptions, with illustrations, of pruning the grapevine, apple, pear, peach, apricot, plum, cherry, gooseberry and raspberry.

1839. ADAM, J. 634.1/2-1.542
Pincements ou non pincements. **(Summer pruning.)**
Courr. hort., 1945, **7**: 123-6, 158-60.
In the first article, after a brief reference to disbudding, summer pruning is discussed at some length and examples are described and illustrated by drawings. The second article is devoted to Lorette pruning, also illustrated.

1840. MURNEEK, A. E. 634.1/7-1.84
Nitrogen fertilizers for fruit trees.
Bull. Mo. agric. Exp. Stat. **489**, 1945, pp. 23.
A general discussion of nitrogen fertilizers applied to fruit trees, including stable and green manure. Recommendations are given on time, rate and method of application, and the effects of nitrogen manuring on a number of tree and fruit characters are shown.

1841. ROGERS, W. S. 631.51
Soil cultivation: how much and why.
Agriculture, 1946, **53**: 113-5, bibl. 3.
The author, who has acquired a "worm's eye view" in many years of experimental study at East Malling on root growth, soil moisture and soil-plant relationships, discusses a few controversial views on soil cultivation methods. One of the effects of cultivation is to stimulate the decomposition of organic matter with a resulting release of ready-balanced nutrients to the crop and, of course, at the same time a decrease in the soil organic matter. As long as the organic matter content of the soil is maintained by supplying fresh materials and no "overdraft" is made, cultivation must be regarded as beneficial under British conditions. On the other hand, the author saw the dust bowl condition approached in a Kentish orchard, where organic manures were withheld and constant cultivation practised. The logical conclusion of the discussion is "to make a good seedbed, control the weeds, maintain the soil organic matter to an optimum level and to give just such an amount of cultivation as together with the fertilizer dressings will unlock sufficient nutrients for the crop that is being grown".

1842. LYON, A. V., AND PENNEFATHER, R. R. 631.67
Furrow irrigation of community settlements.
J. Coun. sci. industr. Res. Aust., 1946, **19**: 38-45.
The irrigation efficiency ratio in horticultural settlements of the River Murray irrigation area, where furrow irrigation is the general practice, is often as low as 33%. Although the economic use of water is more easily achieved by spray irrigation, efficiencies of 70-80% are attainable in furrow irrigation if applications under the present system of periodicity do not exceed 4 in. Correct design and conduct of furrows are explained according to the latest experimental results.

1843. DECKER, P. 631.874
The effect of depth of planting on the emergence and survival of blue lupine.
Phytopathology, 1946, **36**: 479-80.
One of the most serious troubles of blue lupin (*Lupinus angustifolius* L.) as a winter cover crop in Florida is the loss of plants in the seedling stage. Among the organisms isolated from the dead or dying plants, *Rhizoctonia* spp. far outnumbers all others. The degree of infection was found to be related to depth of sowing. In a greenhouse experiment seeds were sown at depths of 1 in. and 2 in. Twenty-one days after sowing, when the plants in the shallow plantings were about 8 in. high, 70·7% of these plants appeared healthy, while only 6·5% of the plants in the deeper plantings were alive.

Marketing.

1844. HEUSEL, M. 634.23
Zur Kirschenqualitätskontrolle 1946. **(Government supervision of quality standards in cherries 1946.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 364-8.
In Switzerland, fruit quality is standardized and sales of producers to salesmen are supervised by Government officials. The working of the scheme in operation for cherries is described.

1845. VAN CAUWENBERGHE, E. 634.1/2-1.541.11
a Considérations sur les sujets porte-greffes pour arbres fruitiers. **(Fruit tree rootstocks.)**
Courr. hort., 1941, **5**: 188-9. [Received Aug. 1945.]

b FJÄDERHANE, A. 634.1/7(485)
Fruktodlingen genom krisåren. **(Fruitgrowing in Sweden during the emergency.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 165-76.

SMALL FRUITS, VINES AND NUTS.

1846. HOARE, A. H. 634.7
Fruit growing on the farm. II. Soft fruit.
Agriculture, 1946, **53**: 124-8.

For the first article in this series, dealing with apples and pears, see *H.A.*, 16: 1784. In this second paper it is suggested to farmers that they should help to counteract the sharp decline in British soft fruit production. Figures are cited for soft fruit acreage in 1925 and 1944, that of strawberries, for instance, having fallen from 28,000 to 9,000 during this period. Advice is given on suitable varieties and conditions and the importance of building up a healthy stock is explained. This could be achieved without difficulty on general farms, where isolation requirements are easily fulfilled. A further point in favour of taking up soft fruit growing is that sufficient manure would be available. As with top fruit, the author suggests a limitation to an area of 5-10 acres, and he adds the recommendation that farmers should specialize in one type of soft fruit, namely strawberries, bush fruit or cane fruit. The useful life of each kind of plantation is estimated.

1847. RIETSEMA, I. 634.711
Frambozenteelt. **(Raspberry culture.)**
Tuinbouw, 1946, No. 3, pp. 6-8; No. 4, pp. 4-7.

A popular account of the raspberry, discussing varieties, propagation, planting, supports, cutting back, manuring, diseases and pests.

1848. GRUBB, N. H. 634.711
Malling Promise raspberry.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, p. 133.

A new variety of raspberry, raised at East Malling and distributed for the first time in 1944, is described. Observations and small scale tests indicate that the variety is highly resistant to natural mosaic infection and that most of the cane in current circulation is virus-free.

1849. PERCIVAL, M. S. 634.715: 581.46
Observations on the flowering and nectar secretion of *Rubus fruticosus* (Agg.).
New Phytol., 1946, **45**: 111-23.

Terminal flowers of the blackberry have an average life of 90 hours as against 60 hours for subterminal flowers. There are two peaks in the blooming due to the opening of the terminal and sub-terminal flowers respectively. The amount of sugar secreted per flower varies from 19·5 to 3·7 mg. Secretion varies in amount with the age of the flower. Flowers borne on stouter shoots secrete more nectar than those borne on thinner shoots.

1850. TYDEMAN, H. M. 634.722 + 634.723
Black and red currants for the garden.
J. roy. hort. Soc., 1946, **71**: 305-7.

The selection of black and red currants recommended as suitable for private gardens covers early, early midseason, late midseason and late varieties, so that the picking period of both sorts may be extended over 5-6 weeks.

1851. SAUVAGE, G. 634.75-1.544
Le forçage du fraisier. **(Forcing strawberries.)**
Courr. hort., 1941, **5**: 351-2. [Received Aug. 1945.]

Describes the method of raising strawberry plants for early fruiting, and the treatment of the plants after they have rooted. Under forcing conditions damage may be caused by leaf spot (*Sphaerella fragariae*), red spider and green fly; recommendations are given for their control.

1852. SUMNEVIČ, G. P. 634.8
Wild grapes of the western Tian-Shan. [Russian.]
J. Bot. U.R.S.S., 1946, **31**: 41-7.

At least two species of grape are cultivated in Central Asia. One consists of varieties of the hitherto undescribed *Vitis schrederi* Sumn., a species which is said to be descended from the original wild grape of the tertiary epoch. The wild grapes have survived in three separate localities where they have been undergoing secondary species formation, and have been drawn upon by the inhabitants, under whose influence they have developed into the many excellent varieties of grape which are to be found at present. *Vitis vinifera* was introduced in comparatively recent times. At one of the three localities just referred to, *V. silvestris* Gmel. has been identified.

1853. CAPUCCI, C. 634.8-1.546
Gli alberi da frutto nelle piantate di viti. **(The use of fruit trees in vineyards.)**
Riv. Fruttic., 1943, **7**: 77-92.

Evidence is submitted of the reciprocal damage suffered by interplanted vines and fruit trees when the latter are grown as supports for the vines, but under certain conditions the interplanting of vines with fruit trees can be recommended. The author describes the three chief methods of planting adopted in Italy for growing fruit trees and vines in association; they are named after the districts where they are practised, i.e. Alva, Casena, and Romagna. (For information on living and inert supports for vines, see *H.A.*, 5: 572; 8: 1016; 9: 1202.)

1854. PEYER, E. 634.8-1.541.11
I. Jahresbericht über die Geschäfte der Genossenschaft zur Produktion von amerikanischem Unterlagenholz im Inland zur Rebveredlung, 1945. **(First annual report of the co-operative society for the production of American vine stocks in Switzerland, 1945.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 269-71.

The desirability of establishing nurseries of American vine stocks in Switzerland was outlined by the author, *ibidem*, 1943, 52: 472-4; *H.A.*, 13: 1221. Such a nursery has now been established on a co-operative basis in the Canton of Valais, selected clones having been provided by the Wädenswil Research Station. The establishment of a similar nursery in Eastern Switzerland is intended. In addition, a number of private growers have undertaken to propagate selected American rootstock clones on a small scale.

1855. BRANAS, J. 634.8-1.537
Fonctionnement de la Section de sélection et de contrôle des bois et plants de vigne en 1945. *Second rapport annuel.* **(Second annual report of the Section devoted to the selection and control of vine propagating material and plants in 1945.)**
Section de sélection et de contrôle, Montpellier, 1946, pp. 14, bibl. 2.

This newly established Section of the Plant Protection Service at Montpellier is concerned with the supervision of all vine propagating material, rootstocks and scion varieties and of vine nurseries. The report year 1945 was the first in which the new scheme began to work under fairly normal conditions.

1856. MELJNIK, S. A. 634.8: 581.162.3
Artificial pollination, its role and importance for bisexual varieties of grapes. [Russian.]
Armgiz (Armenian State Publishers), Erivan, 1943, 30 pp., bibl. 23.

The author mentions that in many bisexual varieties of grape the crop is improved by cross-pollination from neighbouring vines. To ensure this he recommends: (1) Construct windbreak to reduce the speed of strong winds, so that the pollen is not carried to a long distance but readily settles on the stigmas. (2) Keep the bushes open to permit pollen reaching the flowers easily. (3) The shoots and inflorescences on vines trained on wire supports should be so spaced that the flowers are easily pollinated. (4) Tie up separate shoots or small groups so that they catch the wind-borne pollen. (5) Shake the vines at flowering time to scatter the pollen, and to shake off the calyx-caps of the cleistogamous varieties.

857. SNYDER, J. C. 634.8-1.542
Proper way to prune grapes is explained.
Better Fruit, 1946, **40**: 9: 26-32.
The most popular system of pruning American grapes is the one-stem, four-cane Kniffin renewal system. Start with the young plant at setting time and remove all except the strongest cane and cut it back to two buds. As soon as the new shoots growing out of the two buds are 2 inches long, select the strongest one and rub off all others. Go over them two weeks later and rub off shoots again. This is the only pruning that should be done until the following February or March. The construction of the trellis is described, and the training and further pruning of the vines is illustrated by sketches.

858. MALAN, A. H. 634.8
Fertilization of grapes.
Fmg S. Afr., 1946, **21**: 293-6.
The most important commercial table grape varieties in the Union, such as Waltham Cross, Alphonse Lavallée and Hanepoot, particularly the last, are subject to non-setting as a result of imperfect fertilization. The causes given for the trouble include excess of nitrogen, wrong pH value with possibly resulting phosphate deficiency, unsuitable site, soil or cultivation methods, wrong rootstock, trace element deficiency, lack of cross pollination, unfavourable weather during the pollination period and hereditary defects. The best manurial, pruning, tipping or topping treatments, etc., providing favourable conditions for fertilization, are described.

859. GLENN, E. M., AND WITT, A. W. 634.51-1.521
Progress report on the walnut variety collection at East Malling.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 70-4.
Two plantations of walnut varieties at the East Malling Research Station are described and the results recorded on vigour, times of leafing out, frost damage, pollination and cropping. Notes are included on the more important varieties. The three best varieties of English dessert walnuts are Northdown Clawnut, Excelsior of Taynton and Secrett. English pickling varieties are Leeds Castle and Patching.

860. GLENN, E. M. 634.51-1.541.11
Variation in non-clonal Franquette and Mayette walnuts.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 67-9, bibl. 2.
The variation in habit, foliage, and nuts of walnut trees received from the Continent as the varieties Franquette and Mayette is described, and comparisons have been made with standard clones of the two varieties. Such variation in material is obviously undesirable for commercial purposes. Moreover, the trial described shows, in relation to walnuts as with other fruit trees, the futility of conducting experimental work (e.g. rootstock trials) with unstandardized scion material. The variations in types of nut of the non-clonal trees as compared with standards of the two varieties are shown by drawings.

861. BRYNER, W. 634.51-1.521
Wahl des Nussaatgutes und Anzucht der Sämlinge. **(Selection of walnut seeds and the raising of seedlings.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 384-6.
For every walnut tree cut down in Switzerland the law insists that two new ones must be planted. The author sets out the desirable characters of parent trees to be selected as a source of seed. The raising of seedlings is also described.

862. DANIELSSON, B. 634.54-1.523
Polyploida hasseltyper. **(Polyploid types of hazel.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 116-22, bibl. 7.
At Balsgård breeding work with *Corylus avellana* was started in the year 1943. Nuts were collected of wild growing *Corylus avellana* in Southern Sweden. In 1944 about 1,500 nuts with two or more seeds were brought together for investigation. The somatic chromosome number was found to be 22, which was confirmed by studying the meiosis. One triploid plant and several tetraploids were obtained, the latter after colchicine treatment of germinating seeds. The stomata of triploid and tetraploid plants are very much larger than those of corresponding diploids. [Author's (English) summary.]

1863. MARQUES DE ALMEIDA, C. R. 634.55: 581.162.3
Àcêra da improdutividade na amendoeira. **(Infertility in the almond.)**
Reprint from *An. Inst. sup. Agron. Lisboa*, 1945, Vol. **15**, 186 pp., bibl. over 300.
Productivity in the almond (*Prunus amygdalus*) is very irregular and some varieties crop very poorly. This is usually attributed to the virtual self-sterility of the species. It was thought that inter-incompatibility was frequent among varieties and that pollinators were necessary. The writer undertook to study the problem. The factors underlying infertility are discussed and the effect of ovarian extracts on pollen grain germination was studied. It is shown that affinity between two varieties can be accurately determined only by following the development of the pollen tube through the tissues of the style, and a technique for this purpose was devised. The development of the pollen tube was followed in 184 combinations. It was found that pollen grains are mutually stimulated when crowded together. Two opposite influences appeared to act on compatibility: pollen grains or pollen tubes, on one side, acting as stimulants on each other; oospheres or embryo sacs, on the other, act in an opposite sense. All the varieties studied are diploids with n = 8 in the haploid form. Almost every variety of almond has proved to be self-incompatible, though the varieties Jose Dias and Duro Italiano are economically self-compatible. Local manifestations of compatibility are probably due to the influence of ecological conditioning on the selective action of compatibility.

1864. GUERREIRO, M. G., AND FERNANDES, C. T. 634.531
O castanheiro no distrito de Bragança. **(Spanish chestnut in the district of Braganza.)**
Bol. Junta nac. Frut., Lisboa, 1945, **5**: 7/**8**: 1-32.
The climate and geology of the district are described and the present distribution of the chestnut there is shown by maps. The article is a plea for a more intensive culture of the chestnut. Its cultivation is described and reference is made to its diseases, particularly the ink disease, caused by *Phytophthora cambivora*.

1865. VAN DEN EYNDE, E. 634.8
a Etat civil de la variété nouvelle de raisins " Muscat Doré Van den Eynde ". **(Muscat Doré a new variety of grape.)**
Courr. hort., 1942, **6**: 67-8. [Received Aug. 1945.]
A new successful Muscat of Alexandria hybrid.

b HAVIS, L. 634.75(77.1)
Strawberry production in Ohio.
Bull. Ohio agric. Exp. Stat. **626**, 1942, pp. 41, bibl. 24.

c LARSEN, E. L. 634.51
Pehr Kalm's report on the characteristics and uses of the American walnut tree which is called hickory.
Reprinted from *Agric. Hist.*, 1945, **19**: 58-64.
A translation of a Swedish paper published in 1778.

d PARADIS, J. R. 634.75(71.4)
La culture des fraises dans le Quebec. **(Strawberry growing in Quebec.)**
Reprinted from *Rev. d'Oka*, 1945, pp. 20, bibl. 13.

PLANT PROTECTION OF DECIDUOUS FRUITS.

1866. FLOOR, J. 632.95(42)
Ziektenbestrijding in Engeland. **(Pest and disease control in England.)**
Tuinbouw, 1946, No. 2, pp. 20-1, bibl. 7.
A comparison of various types of installations used in England in pest and disease control.

1867. ANON. 656.7: 634.1/7
Helicopter used to control pests in orchard.
Better Fruit, 1946, **41**: 2: 8.
In discussing the use of helicopters in pest control it is mentioned that they can also be used for drying cherries by removing drops of rain-water which would induce cracking and rot. In a demonstration the helicopter was flown at tree-top height up one row and down another, at a speed of 4 to 5 miles an hour. The 33-foot rotor, powered by a 175 h.p. engine, sends a blast of air downward at a speed of 25 miles an hour. The entire tree is shaken vigorously and the water on leaves and fruit falls to the ground.

1868. VAN KOOT, I. 632.95
De beteekenis van de hygiëne in den tuinbouw. **(The importance of hygiene in horticulture.)**
Tuinbouw, 1946, No. 5, pp. 4-8.
The importance of orchard hygiene is stressed. The author, discussing control measures against pests and diseases, puts the latter into three categories in relation to the control measures necessary: (1) Those parasites or pests that develop outside the host plant, (2) those that spend part of their life cycle within the host plant, and (3) those that begin and complete their life cycle within the plant and may become systemic. Examples of the three categories are cited and illustrated and special attention is given to the third, which includes most virus and bacterial diseases and certain fungal diseases. Direct and protective measures of control by spraying are not efficient against such diseases, and hygienic methods must be adopted, particularly the removal and burning of all infected plants, the disinfection of greenhouses, and the sterilization of the soil under intensive cultivation.

1869. WILSON, E. E., AND BAKER, G. A. 632.3/4 + 632.8
Some features of the spread of plant diseases by air-borne and insect-borne inoculum.
Phytopathology, 1946, **36**: 418-32, bibl. 20.
A compilation is made of numerical data collected by the authors and other workers on the spread of plant diseases from centres of infection to the above-ground parts of nearby susceptible hosts, and the rate at which the incidence of infection diminished with increases in distance from the source of inoculum is examined. The diseases studied were of three categories: (1) Fungus diseases spread by means of air-borne spores, e.g. brown-rot blossom blight caused by *Sclerotinia laxa*, (2) a bacterial disease spread by means of wind-blown rain, angular leaf spot of cotton, caused by *Phytomonas malvacearum*, and (3) virus and fungus diseases spread by insect vectors.

1870. ROACH, W. A. 632.19: 634/635
Mineral deficiencies in agricultural and horticultural crops.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 83-8, bibl. 10.
This paper summarizes the main conclusions from four years' work by the author and his colleagues on mineral deficiencies in agricultural and horticultural crops. The results of the first three years have been described and summarized (see *H.A.*, 15: 1683) and the present article brings the findings up to date. The author summarizes the results as follows: Mineral deficiencies were diagnosed by plant analysis, plant injection and the estimation of the effect of curative treatment on yield and quality by quantitative field experiments. The work was concerned with deficiencies of phosphorus, potassium, calcium, magnesium, iron, manganese, zinc, boron, copper and nickel and with fruit trees, oats, wheat, barley, peas, carrots, parsnips and potatoes. Large increases in yield were obtained, both when the deficiencies were suggested by symptoms and when no symptoms were apparent. The importance of complete diagnosis was demonstrated by an experiment in which treatment according to diagnosis by symptoms alone was ineffective, whereas, when all the six elements, found by plant injection to be deficient, were supplied, the crop was doubled. Some of the problems involved in determining dosage were dealt with and found to be very complex. Suggestions are made as to the lines along which future work might most advantageously be directed.

1871. BOLAS, B. D. 631.811.9: 633.491
Physiological effects of trace elements.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, p. 89.
The injection of a dilute aqueous solution of manganese sulphate into lateral leaflets of potatoes suffering from manganese deficiency was followed after an interval of about ten days by a marked increase in assimilation rate which lasted about a week and was not necessarily associated with any visible change in the injected leaves. This result is considered to open up a new line of investigation of the physiological function of trace elements in plants.

1872. RICHES, J. P. R. 632.19: 631.811
Use of synthetic resins in the estimation of trace elements.
Nature, 1946, **158**: 96, bibl. 4.
A full description of the method and tabulated data are given. The work was carried out at East Malling Research Station as part of the mineral deficiencies programme of the Agricultural Research Council.

1873. HEWITT, E. J. 635.1/7: 632.19
Experiments in mineral nutrition III. The visual symptoms of mineral deficiencies of crop plants grown in sand culture. Progress report, season 1945.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 44-51, bibl. 5.
A continuation of work reported in the annual reports for 1943 and 1944 (*H.A.*, 14: 1684; 15: 1672), on 29 crops mainly vegetables, grown in sand culture. Particular attention was paid to calcium, boron and iron deficiencies, other deficiencies discussed being nitrogen, phosphorus, potassium and magnesium. Descriptions are given of the symptoms in the different crops. Refinements in technique included the use of the Permutit demineralization method for purification of rainwater used for iron deficiency cultures and highly purified nutrients for iron and boron deficiencies. New methods of pot treatment, including double waxing, bitumen paint and plastics, have been successful for producing calcium and boron deficiencies. A method for transplanting adult plants complete with sand and with minimum root disturbance has been used to produce severe deficiency symptoms of calcium, boron and other trace elements in a short space of time. A high nitrogen level was found to accentuate symptoms of boron deficiency. It is noted that the effect of increased sodium supply on celery in calcium and potassium deficiency cultures needs further investigation.

1874. LUNDBLAD, K. 632.19: 631.811
Mikroelement och bristsjukdomar hos odlade växter. **(Trace elements and deficiency diseases in cultivated plants.)** [English summary ½p.]
K. LantbrAkad. Tidskr. Stockh., 1945, **84**: 435-89, bibl. 86.
In this review of the literature on trace elements prominent

is given to boron, copper and manganese deficiencies because of their importance in Swedish agriculture and horticulture. The bibliography is intended to be a complete list of Swedish publications on the subject.

1875. Bear, F. E., Prince, A. L., and Malcolm, J. L. 631.83: 632.19
Potassium needs of New Jersey soils.
Bull. N. Jer. agric. Exp. Stat. **721,** 1945, pp. 19, bibl. 4.
The crops showing marked K deficiency symptoms on New Jersey soils include apple, peach, cabbage, soya beans, sweet potatoes and tomatoes.

1876. Svanberg, O., and Ekman, P. 581.192: 546.46
Om magnesiumhalten i vegetationen från svenska jordar. **(The magnesium content of plants grown on Swedish soils.** [English summary 1 p.]
K. LantbrAkad. Tidskr. Stockh., 1946, **85**: 54-99, bibl. 33.
The magnesium content of over a thousand samples of hay from different soils in all parts of Sweden was determined. Magnesium deficiency was found to occur on very acid alum soils and on some clay soils in silurian regions. Vegetable growers, as a rule, are alive to the problem and use fertilizers containing the element.

1877. S., J. M. L. 632.19: 546.56
Kopergebrek bij plant en dier. **(Copper deficiency in plants and animals.)**
Cult. Hand., 1946, No. 6, pp. 28-9.
Discusses the effect of copper deficiency in soils, mostly with reference to cereals and fodder crops (and the consequent disorders of animals fed on such crops), but peas and beans are also mentioned. In peas the copper content plays an important part: when it is deficient the leaves become yellow and flaccid, the seed ripens badly, and the yield is much lower than that of healthy plants. On beans the symptoms are less marked, but the affected plants produce swollen pods with few or no seeds that reach maturity.

1878. King, H. W. 634.8-2.111
Some aspects of frost phenomena.
Report submitted to the Berri-Barmera Frost Committee, Berri, South Australia, Sept. 1945, 56 pp.
This is an account in popular language of the factors involved in losses caused by late frosts, with special reference to severe damage sustained by vines in the Berri Irrigation Area on 18 October, 1944. In Part I are discussed in general terms the causes of spring frosts with regard to loss of heat from the soil, the effect of clouds, humidity, wind, water, environment, and of cultural practices (cultivation, irrigation, weeds and cover crops, pruning). Part II deals with preventive measures, based mostly on an analysis of reports received from growers as to the effect of frost under their particular conditions. The author finds evidence in the collected and collated data that by control of irrigations and soil working, combined with the use of cover crops, the area subject to frost can be reduced considerably, and that the actual fruit losses can also be controlled, although perhaps not to the same extent, provided the frost is not too severe. The burning of oil in pots still seems to be the best insurance for a limited area provided they are lit up in time and kept going until at least half an hour after sunrise. With regard to irrigation, which is considered to be a prime factor in controlling frost damage, it has been demonstrated that those districts which had been dry longest suffered worst from frost damage, and that in the Berri area those growers who availed themselves of the October special irrigation fared better than those who did not. Cultivation after watering tended to offset the value of the water.

1879. Preston, A. P. 634.11-2.111
Cracking of apples.
A.R. East Malling Res. Stat. for 1945, **A29,** 1946, p. 75.
The unusual form of damage (seen in May, 1945) described and illustrated consists of from one to five longitudinal cracks on each apple, cross sections showing that they were always opposite the carpels. The fruits grew away healthily but the crack persisted throughout the season. This form of damage is distinct from the cracking caused by scab, " frost eye " or " frost ring ".

1880. Šitt, P. G. 632.111: 634.1/2
Planting and the care of frosted fruit trees. [Russian.]
Moscow workers, 1941, 32 pp. [Received Aug. 1946.]
An outline of the factors underlying the response of the plant to its environment and to cultural treatment, followed by advice on measures to be taken after fruit trees have been subjected to severe frosts. They include measures to prevent the flooding of the trees by melting snow, namely piling the snow in mounds between the rows and across the slope, sawing away trunks killed by frost, and grafting at the collar.

1881. Cornet, J. 632.111: 634.1/7
Le lutte contre les gelées printanières. **(Protection measures against spring frosts.)**
Courr. hort., 1946, **8**: 15-7.
A brief review of the various methods of orchard heating to protect trees from late frost; it describes in some detail heating with oil burners, with tables of data from trials carried out at the experiment station of Châteauneuf.

1882. le Roux, M. S. 634.8-2.112
Sunscald in table grapes.
Fmg S. Afr., 1946, **21**: 506-10.
Vine growers in the Western Cape Province, especially table-grape growers, periodically suffer severe losses from sunscald. On a very hot day in December, when the temperature in the vineyard rose to 103·7° F., observations were made on varietal susceptibility and on the influence of 4 different trellising systems on the amount of damage sustained. The study was carried out on the experiment farm Bien Donne, Groot Drakenstein, where Jacquez is generally used as a rootstock. It was found that in the 15 most important export varieties tested the damage varied from 1% and less in Barlinka, Alphonse Lavallée, Henab Turki, Gros Colmar and Waltham Cross to 33% and more in Flaming Tokay and White Prince. In this estimate the fact that a small number of damaged berries in the middle of a bunch makes the whole bunch unfit for table grape purposes has not been taken into account. With sensitive varieties the trellising system proved of the greatest importance, a wide and high trellis affording the best protection and aeration. In connexion with the report of the results obtained some recommendations are given, including the following: (1) Where possible the trellis should be laid out from east to west. (2) Try to avoid sulphuring during the hot days just before the grapes begin to soften or change colour. (3) Accustom the grapes to strong light gradually by starting to thin out the leaves in good time. (4) The bloom of the bunches assists in protecting the berries against sunscald, hence avoid rubbing by leaves during pre-thinning. (5) When thinning at the green stage, remove the lowest bunches on the outside of the trellis. (6) Guard against insufficient ventilation behind windbreaks. (7) Keep the vineyard moist.

1883. Roland, G. 632.19: 634.11
Sur le brunissement interne des pommes. **(Internal browning of apples.)**
Fruit belge, 1946, **14**: 115-7.
The author compares and contrasts the symptoms of " internal cork " and " bitter pit "; the former, a boron

deficiency disorder, has not yet been found with certainty in Belgium.

1884. VAN SLOGTEREN, E. 632.8
Serologisch onderzoek van virus-ziekten. **(Serological investigation of virus diseases.)**
Tuinbouw, 1946, No. 2, pp. 8-11.
A popular account (illustrated) of the application of serological technique in diagnosing diseases with special reference to the virus diseases of plants. [See also *H.A.*, 16: 363.]

1885. STUBBS, L. L. 632.8: 632.95
A simple hand duster for the application of abrasives and insecticidal dusts in plant virus transmission studies.
J. Aust. Inst. agric. Sci., 1946, **12**: 53-4.
The author has obtained very consistent results in the mechanical transfer of a number of plant viruses (tomato spotted wilt, cauliflower mosaic, legume mosaics, etc.), when the abrasive (600 mesh aloxite or carborundum) was applied prior to inoculation by means of a hand duster (illustrated) of very simple design, being constructed mainly from an Erlenmeyer flask of 250 ml. capacity, and a De Vilbiss atomizer bulb. The duster has been used very successfully in connexion with aphid transmission experiments with a virus disease of carrots. By means of it a commercial 3% nicotine dust is applied through the muslin tops of cylindrical celluloid cages used for covering test plants following aphid transfers. The presence of the cage concentrates the dust on all parts of the plant and in addition increases the efficiency of the fumigatory action of the nicotine.

1886. BLACK, L. M. 632.8
Plant tumours induced by the combined action of wound and virus.
Nature, 1946, **158**: 56-7, bibl. 5.
This is a sequel to the author's earlier paper in *Amer. J. Bot.*, 1945, 32: 408-15; *H.A.*, 16: 219. The present communication deals principally with the role of wounds in tumour inception in plants infected with wound-tumour virus, *Aureogenus magnivena*. On infected stems of sweet clover 175 tumours developed from 387 punctures, while 505 wounds on healthy plants produced no tumours. This plant virus disease appears homologous in many ways with virus tumour diseases of animals.—Rockefeller Institute for Medical Research, Princeton, N. Jersey.

1887. BLODGETT, E. C. 634.25-2.8
Transmission of peach wart by graft inoculations with affected fruit tissue.
Phytopathology, 1946, **36**: 675.
Wedges of warty fruit tissue were inserted in T cuts in the bark of the trunks of young peach trees and held in place by rubber strips. Three years later all the inoculated trees showed typical and severe fruit disease symptoms.

1888. DEMAREE, J. B. 634.73-2.8
Rate of spread of blueberry stunt in a North Carolina field.
Abstr. in *Phytopathology*, 1946, **36**: 684-5.
The rate of spread of stunt, a virus disease of blueberry, varies greatly in different sections and in fields in the same section. Rate of dissemination in fields is undoubtedly associated with the presence and abundance of a vector. Its rate of spread in one particular field is described. The disease spread rapidly in one end of the field, and nearly 50% of the plants over at least half the field were affected at the time of writing.

1889. DEMAREE, J. B. 634.75-2.8
Strawberry virus in Eastern United States.
Abstr. in *Phytopathology*, 1946, **36**: 684.
In a virus disease of the yellows type in strawberries in Eastern United States there is some vein-clearing as well as a chlorosis of a transitory character in some varieties, but the most pronounced and constant symptom is dwarfing due to short and horizontal growth of the petioles. Some varieties appear to be symptomless carriers.

1890. PRENTICE, I. W., AND HARRIS, R. V. 634.75-2.8
Resolution of strawberry virus complexes by means of the aphis vector *Capitophorus fragariae* Theob.
Ann. appl. Biol., 1946, **33**: 50-3, bibl. 18.
Aphides (*Capitophorus fragariae*) were fed for periods up to 24 hours on strawberry plants infected with mild crinkle, severe crinkle or yellow-edge and then transferred to plants of the wild strawberry, *Fragaria vesca*, or of the cultivated strawberry, variety Royal Sovereign. On *F. vesca* the symptoms produced were chlorotic speckling, distortion and dwarfing of the leaves, varying in intensity, and on Royal Sovereign scattered, inconspicuous, diffuse, chlorotic spots. The symptoms from all three sources of infection were similar and were indistinguishable from those of mild crinkle of Harris and King. The virus thus selectively transmitted is tentatively concluded to be the mild crinkle virus. The virus was transmitted after feeding periods of 1 hour or more and did not generally persist in the vector for more than 3 hours. [Authors' summary.]

1891. PRENTICE, I. W. 634.75-2.8
Resolution and synthesis of virus complexes causing strawberry yellow-edge.
Nature, 1946, **158**: 24-5, bibl. 3.
Making use of differences in their vector relationships, the author separated two viruses from strawberry plants diseased with yellow-edge, namely the mild crinkle virus and, what is provisionally termed, the mild yellow-edge virus. He also succeeded in synthesizing yellow-edge by combining the two virus complexes. A second etiologically distinct type of strawberry yellow-edge was produced by combining the mild yellow-edge virus with the severe crinkle virus. Thus the two types of yellow-edge have the mild yellow-edge virus in common.—East Malling Research Station.

1892. SALLES, B. 634.8-2.8
La reconstitution du vignoble. **(The restoration of the vineyard.)**
Prog. agric. vitic., 1946, **125**: 9-12, 36-42, 65-9.
The restoration of vineyards to good productivity depends largely on eliminating court-noué. While no cure is known the preventive measures recommended are to plant only disease-free rootstocks, in a soil free from phylloxera and isolated from other vineyards, and to ensure that the scions are not contaminated by the disease and are otherwise of good quality.

1893. LEVADOUX, L. 634.8-2.8
Chronique du court-noué. **(The court-noué disease.)**
Prog. agric. vitic., 1946, **126**: 124-6.
Court-noué of the grapevine was introduced into Doméra (in central France) on buds of Seibel hybrids 4643, thus making necessary the examination of material for budding. The disease has spread rapidly in the phylloxera soils, which it should be noted, are also the richest in potash.

1894. FRAZIER, N. W., AND FREITAG, J. H. 634.8-2.8
Ten additional leafhopper vectors of the virus causing Pierce's disease of grapes.
Phytopathology, 1946, **36**: 634-7.
Ten additional species of leafhopper are shown to be vectors of the virus of Pierce's disease of grapes; none of them appears to be of any importance under field conditions in the spread of the virus to alfalfa or grapevines.

1895. MOORE, M. H. 632.3: 634.22+634.23
Bacterial canker and leaf spot of plum and cherry. A summary of present knowledge of control measures in Britain.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 134-7.
The use of a resistant frame-work and foliage spraying with

opper-containing bactericide in summer at present offer
ost promise for controlling this disease in plum, and while
rame-working similarly holds promise for cherry, very good
esults were obtained by spraying with home-made Bordeaux
ixture in autumn (at 10: 15: 100) and spring (at 6: 9: 100).
eference is made to varietal susceptibility and resistance,
o the influence of rootstock, and to experiments on the
pplication of inorganic fertilizers. Other hosts subject to
ttack are mentioned. [Author's summary.]

896. BJÖRLING, K., AND NILSSON, L. 634.22-2.3
Bakteriell hagelskottsjuka på plommon. (**A bacterial shot-hole disease of plums.**)
Växtskyddsnotiser, 1945, No. 6, pp. 81-4.

shot-hole disease of Victoria plums was studied, which roduces symptoms on leaves and fruits like those caused y *Pseudomonas mors-prunorum*, the symptoms on the tree greeing with those of bacterial canker. However, the acteria isolated from infected leaf and fruit tissue are not *. mors-prunorum*, resembling rather *P. prunicola* and to ome extent *P. pruni*. A full description of the symptoms nd of the bacterium is given. The investigation is being ontinued.

897. TROFIMOVIČ, A. G. 634.11-2.3
Crown gall in apples and its relation to growth peculiarities.
Proc. sci. Conf. Timirjazev agric. Acad., 4-11 June, 1945, 1946, pp. 95-8.

Vild apple seedlings mainly in the orchard were inoculated n the region of the root collar with pure cultures of *Bacterium umefaciens* and 60-70% became infected. Individual eedlings reacted in different ways. Thus some only eveloped the disease at the end of the growing period, vhile others differed only as to length of inoculation period r intensity of gall formation. These differences were ound to be related to differences in growth phenomena in he different plants. Taking large groups into consideration isease incidence was noticeable in both strong and weak rowing plants, but, in general, symptoms were slight in igorous plants, whereas in weak plants they were either bsent or very marked. Both the greatest susceptibility nd the most marked symptoms occurred in those plants n which the inoculation was carried out during a period of narked increase of growth as shown by stem thickening. Moreover, the symptoms were worse in plants which owed uneven growth than in those the growth of which as uniform. In the spring following the infection the galls ere as a rule persistent and contained large amounts of arch, but later they either became larger or tended to isintegrate. Environmental conditions were an important ctor in the persistence of the galls. Under laboratory nditions seedlings grown in soil under conditions of efficient light were backward, the galls grew and disinteg- ated only on the death of the host. Under water culture nditions the galls persisted and inhibited growth of oots and buds in the hosts. The conclusion was reached at the provision of conditions assuring uninterrupted plant rowth will effectively control the disease. This can be hieved by cultural methods.

898. WALLACE, T. 664.85.11: 632.4
Orchard factors affecting storage rots.
Reprinted from *Worcestershire agric. Chron.*, May 1946, pp. 8.

he experiments discussed in this paper were carried out at ong Ashton each season during the period 1927-38. The uthor summarizes his results as follows: "Wastage in ore, due to fungus rots, is likely to be influenced by rchard factors in the following ways: *Varieties*: Suscep- bility to different fungi is variable. *Rootstocks*: Malling os. VII and IX tend to give high values and No. V low alues. *Age of trees*: No effect was established and further sts are required. *Soil conditions*: Loamy texture may be perior to coarse textured sand and gravel. *Seasonal conditions*: The incidence of storage rots varies from season to season and rots may be more prevalent in wet seasons. *Cultural systems*: Grass + nitrogen may give higher rots than cultivation only. *Manuring*: Treatment of potash-deficient trees by NK, K and N fertilizers may increase susceptibility to rots. *Fruit thinning*: No consistent effects have resulted from thinning. *Bark ringing and root pruning*: Effects on rots are likely to be negligible where breakdowns do not occur. *Early and late picking*: Late picking is likely to promote susceptibility to rots. *Exposed and shaded fruits*: Shaded fruits are more susceptible than exposed fruits. *Position of fruits on cluster* (*terminal and lateral fruits*): Terminals may promote lenticel spotting which may be followed by other rots but otherwise storage rots are likely to be similar. *Size grading*: Rots may be associated with a particular size grade but this may be large, medium or small."

1899. STAHEL, M. 634.11-2.4
Die Krebskrankheit unserer Obstbäume, ihre Ursachen und Bekämpfung. (**Fruit tree canker, its causes and control.**)
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 285-91.

The article deals chiefly with the canker of apple trees caused by the fungus *Nectria galligena*. The existence of a relationship between canker and scab susceptibility was confirmed by observations made on Brugger Reinette. This apple variety was considered scab-resistant up to a few years ago. Since it lost this characteristic canker incidence with resulting die-back has been remarkably high, especially in re-worked trees. Excessive nitrogen applications and too severe pruning were also found to be conducive to canker, partly because of the frost damage to which the soft growth of such trees is liable. Another environmental factor favouring the disease is badly drained, heavy soil, again because it lowers frost resistance. Varieties are named which are highly susceptible to canker under these conditions. A comparison of similar lesions on 4-year-old branches of Bohnapfel and Aargauer Jägerapfel showed that the fungus behaviour differs with the variety. Thus on the lesions of Bohnapfel, which is considered fairly resistant to *N. galligena*, only a limited number of fruiting bodies come up, while lesions on the very susceptible Jägerapfel appear almost red. Surgical treatment, bridge-grafting and re-working are discussed.

1900. TUNBLAD, B. 634.11-2.42
Några iakttagelser i samband med besprutnings-försök mot skorv. (**Some observations on a spraying trial against scab of apples.**)
Växtskyddsnotiser, 1945, No. 6, pp. 87-8.

The tabulated results of this spraying trial clearly show the advantage of a full spraying programme against apple scab in a season which—as that of 1945—favours the development of the fungus. Not only is the percentage of scabby fruit considerably reduced, but also the weight of healthy fruit is increased. In the variety Sävstaholm, one of the two varieties used, the average weight of bordeaux-treated, first-class apples was 106 g. as compared with 64 g. in the controls. The average weight of first-class fruit from trees of the same variety treated with lime-sulphur amounted to 86 g.

1901. BJÖRLING, K. 634.11-2.4
Forttsatta rön angående en nyligen beskriven äpplesjukdom. (**Further experiments on the apple disease caused by *Pleospora mali* (*Stemphylium congestum*).**)*
Växtskyddsnotiser, 1945, No. 6, pp. 92-4.

Experimental work on the apple disease caused by *Pleospora mali* (*Stemphylium congestum*) was continued in the summer of 1945. The fungus attacks both fruit spurs and ripe fruits, the latter through a wound, and—as reports from other countries show—it may also become a storage parasite.

* See *ibidem*, 1945, No. 3, pp. 45-8; *H.A.*, 15: 1575.

Its occurrence in the larger black spots of *unripe* apples is a secondary phenomenon. Observations show that such spots are caused, in the first instance, by sun scald. Normally, the spots assume a brown colour, but they turn black if incidental infection by *P. mali* occurs. Whether symptoms of the initial stages of water core, appearing at the same time, may be interpreted as a mild case of sun scald, remains to be investigated.

1902. ROLAND, G. 632.4: 634.13
La septoriose du poirier. **(Pear septoriose.)**
Fruit belge, 1946, **14**: 32-6, bibl. 17.
Pear leaf fleck (*Septoria piricola* = *Mycosphaerella sentina*) is described, and a list is given of 36 varieties of pear showing the degree of their susceptibility to the disease. For control a copper-containing preparation is recommended for use before the fruit is well set; afterwards lime-sulphur is preferable.

1903. JENKINS, A., FORSELL, M. J., AND BOYLE, L. W. 632.42: 634.1
Identity and known distribution of *Elsinoë piri* in Washington and Oregon.
Phytopathology, 1946, **36**: 458-60.
Photographs illustrate the damage caused by *Elsinoë piri* on apple fruit and leaves and on pear leaves, and a map shows the distribution of the fungus on apple, pear and quince in Washington and Oregon.

1904. DELHAYE, R. 634.13-2.4
Note sur la moisissure rose de poires sur l'arbre. **(Pink rot of pears on the tree.)**
Fruit belge, 1944, **12**: 55-6.
Describes an attack on pears before picking by the pink rot fungus *Trichothecium roseum*, after the wet summer of 1943. The application of copper-containing or lime-sulphur sprays is recommended as a means of controlling the disease. Fruits apparently sound, but taken from affected trees, should be stored at a low temperature (1-2° C.). An illustration of infected pears is shown in the next number of the journal.

1905. HALLEMANS, A. 632.48
De Moniliazickte en haar mogelijke bestrijding. **(The *Monilia* diseases and their control.)**
Cult. Hand., 1946, No. 7, pp. 17-8.
This is a popular account, illustrated, of various monilia diseases of stone and core fruit. In general, copper-containing sprays are recommended for control, but on copper-sensitive varieties organic sulphur preparations should be used. A warning is given not to spray stone fruits with lime-sulphur or other polysulphide after blossoming.

1906. DELHAYE, R. 632.48: 634.11 + 634.12
Moniliose ou rot brun du pommier et du poirier, *Monilia fructigena* Pers. **(Moniliosis or brown rot of the apple and pear.)**
Courr. hort., 1945, **7**: 102.
A popular account, with rough sketches, of brown rot of apple and pear fruits caused by *Monilia* [*Sclerotinia*] *fructigena*. The same fungus is here said to attack the flowers also. Spraying with copper-containing sprays as used against scab is mentioned as having some effect against it.

1907. ESTIENNE, V., AND SOENEN, A. 632.48: 634.1/7
La moniliose des arbres fruitiers à noyau. **(The *Monilia* diseases of stone-fruit trees.)**
Fruit belge, 1946, **14**: 70-80, 81-95.
This is mostly a general account of the brown rot fungi *Sclerotinia fructigena* and *S. laxa* and the damage they cause. It is stated that in Belgium in certain seasons the loss in sweet cherries from brown rot diseases may be as high as 30% and some acid cherry plantations are being destroyed. The author describes some of his own experiments for the control of blossom wilt on acid cherries. He reduced th degree of infection by (1) spraying in winter (early Marc with carbolineum and with a spray fluid containing dinitr ortho-cresol, (2) pre-blossom spraying with copper ox chloride and with an organic sulphur preparation.

1908. ROSELLA, E. 634.2-2.42
La coulure des fleurs et le dessèchement des rameaux d'arbres fruitiers à noyaux. **(Flower-drop and the withering of branches of stone-fruit trees.)**
Prog. agric. vitic., 1946, **126**: 73-4.
The dropping of flowers and withering of twigs of stone-fru trees is attributed to *Coryneum* in the peach and to *Monil* in the apricot. The flower-drop is most severe when th branches themselves are affected; it is thus necessary, i the first place, to protect the branches by winter treatment in practice, at bud-burst, just as the petals show. But th should be supplemented by other treatments—on apric and plum during the growing period, on peach in autumn protect the branches from infection by *Coryneum* in winte In the peach this autumn spraying is indispensable, pa ticularly in central France where the winter infections a often severe. In autumn, as well as at the end of wint the use is recommended of bordeaux mixture containi 2% copper sulphate and 2% lime. On apricots and plur the damage is mostly caused by *Monilia*, and the bud-bur spray is followed by treatments (*a*) after the fall of the peta (*b*) 5 to 6 weeks before the fruit ripens, with bordea mixture at half the strength mentioned above.

1909. LOUW, A. J. 634.21-2.4
Green rot in apricots.
Fmg S. Afr., 1946, **21**: 308, 312.
During the last two seasons green rot of apricots, caused by fungus and occurring on fruits and year-old twigs, w again prevalent in the south-western districts of the Ca Province, causing widespread damage. Apart from sanita measures, three bordeaux applications in early spring a recommended for its control: (1) at the first stages of b swelling 4 lb. copper sulphate and 4 lb. lime to 50 gallo of water; (2) at 75% petal fall 2 lb. copper sulphate a 9 lb. lime; (3) the same as (2), a fortnight later.

1910. MUJICA R., F. 632.48
El genero Fusarium en Chile. **(The genus *Fusarium* in Chile.)**
Agric. tec. Chile, 1944, **4**: 224-9, bibl. 3.
The literature on the genus *Fusarium* in Chile is revie and the species observed up to date in the country mentioned. Five species of horticultural interest, hitherto recorded for Chile are: *Fusarium culmorum* the grape vine; *F. semitectum* on banana; *F. solani* lemon; *F. rubi* on strawberry and *F. sambucinum* on pota

1911. BRANAS, J. 634.8-2.482
Pourriture grise. **(Grey mould.)**
Progr. agric. vitic., 1946, **126**: 86-9.
An account of the conditions favouring severe infection grapes by *Botrytis cinerea*, with a coloured plate showin bunch of grapes almost destroyed by the mould.

1912. MASSEE, A. M. 632.6/7
Notes on some interesting insects observed in 1945.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 90-5.
These notes comprise observations during the year on following:—ground beetle (*Laemostemus terricola*) stored apples; little longicorn (*Tetrops praeusta*) on spurs; apple twig cutter (*Rhynchites coeruleus*), cau damage to apple, pear, plum, cherry, peach and necta around Maidstone, and laurel and wistaria in Hampsh apple fruit rhynchites (*Rhynchites aequatus*) punctu apple fruitlets; strawberry rhynchites (*Rhynchites germ cus*) on strawberries and blackberries; fruit bark b

colytus rugulosus) on pear; shot hole borer (*Anisandrus spar*) on apple and cherry; flat-celled shot borer (*Xyleborus xeseni*) on cherry; clay-coloured weevil (*Otiorrhynchus igularis*) on raspberry; cockchafer (*Melolontha melolontha*) apple fruitlets; leaf weevil (*Polydrosus cervinus*) on apple, ar, plum, cherry, nut and hawthorn; vine weevil (*Otiorynchus sulcatus*) on strawberry and hop; the spring usher *rannis leucophaearis*) on apple; feathered thorn (*Colotois nnaria*) on apple; V moth (*Itame wauaria*) on gooseberry; dling moth (*Cydia pomonella*) on apple; winter moths on erry; crab leaf miner (*Nepticula malella*) on apple; um sawfly (*Hoplocampa flava*); lacewing fly (*Coniopteryx eiformis*), a predacious insect on the fruit tree red spider; awberry tarsonemid mite (*Tarsonemus pallidus*).

13. Whitehouse, W. E. 634.25-1.541.11-2.651.3
Peach rootstocks resistant to root knot nematode.
Agric. tec. Chile, 1944, **4**: 145-50, bibl. 11.

spite of the favourable conditions for fruitgrowing on the ht sandy soils of the southern States of U.S.A., the attacks eelworms (*Heterodera marioni*) are a serious limiting ctor to the cultivation of peaches. Investigations aimed discovering a rootstock resistant to the nematode have own that varieties Yunnan (P.1. 55776) from the Chinese ovince of that name, Shalil (P.1. 63850) from the northst of India and Bokhara (Turkestan, U.S.S.R.) are highly sistant, and have other good qualities such as vigour, ecocity, etc. Genetically resistance is a dominant aracter in the first two varieties and can be transmitted nen they are used as male or female parents. Particular sistance was observed in the progenies from free pollinan and autopollination of the varieties mentioned and also the variety P.1. 61302 (Cling Bolivian × nectarine Quetta) d in the nectarine Quetta (from the north of India) and aveller.

14. Snapp, O. I. 634.25-2.653
DDT to control bugs that cause deformed peaches.
J. econ. Ent., 1946, **39**: 41-3.

r some years, the tarnished plant bug, *Lygus oblineatus*, used deformation of 20% of the peaches in some orchards Spartanburg County, South Carolina. Five per cent. DT dust or a spray of corresponding strength effected ntrol.

15. Woodside, A. M. 634.25-2.653
Cat-facing and dimpling in peaches.
J. econ. Ent., 1946, **39**: 158-61.

ach growers in Virginia have been suffering considerable sses from cat-facing and dimpling of the fruits caused imarily by the feeding of 3 stinkbug species of the genus *schistus*, when the fruits are small, and of the green nkbug in midsummer respectively.—Virginia Agricultural periment Station.

16. Baron, C. 632.654.2: 634.1/2
Un parasite nouveau du prunier dans le Namurois. **(A new plum pest in the neighbourhood of Namur.)**
Fruit belge, 1945, **12**: 72-3.

bout the middle of February, 1945, many bud axils on year-old plum branches were found infested with egg asses and red larvae, which might easily have been mistaken r those of the plum red spider except that they were ger. The pest proved to belong to the oribatid group of arids, with habits rather different from those of the plum d apple red spider. Good control has been obtained th 2% dinitrocresol and with 4% carbolineum, applied the larval stage.

17. Bailey, J. S., and Bourne, A. T. 634.73-2.654.2
The control of the blueberry bud mite.
J. econ. Ent., 1946, **39**: 89, bibl. 4, being *Contr. Mass. agric. Exp. Stat.* **581**.

p to now the blueberry bud mite, *Eriophyes vaccinii*, has defied all control measures attempted, but the latest experiments show that the dinitro compound DN-111 will control it if applied at the rate of 16 oz. to 100 gall. in mid-June and at a pressure of 150-175 lb., forcing the spray down in between the base of the bud scale. Injury to the bushes was much more severe when a higher pressure was used.

1918. Hough, W. S. 634.11-2.654.2
The control of mites on apple trees sprayed with DDT.
J. econ. Ent., 1946, **39**: 266-7.

Of the materials incorporated in DDT sprays for red spider control in apple orchards treated for codling moth, 40% DN-Dry Mix.* 0·67 lb. in 100 gallons of spray gave the best results when added to 25% DDT, 2 lb. plus lead 3 lb. The addition, which was made in the 5th, 7th and 8th cover sprays, reduced the red spider population per 100 leaves to 19, as compared to 3,369 following applications 25% DDT, 4 lb. DDT concentration was found to have no influence on the population of red spider.—Virginia Agricultural Experiment Station.

1919. Hough, W. S., Clancy, D. W., and Pollard, H. N. 634.1/2-2.752
DDT and its effect on the comstock mealybug and its parasites.
J. econ. Ent., 1945, **38**: 422-5.

Satisfactory control was obtained in a heavily infested orchard from the use of 1·5 lb. of DDT per 100 gallons in sprays directed against the young of the first and second generations or against second generation only. Mites increased greatly on foliage which received the DDT sprays. Adults of the parasite *Pseudaphycus* sp. were very susceptible to spray deposits of DDT at all concentrations (0·5 lb. to 2 lb. per 100 gallons) used in the laboratory. Orchard parasitization became less following DDT sprays but increased rapidly after spraying had been stopped in August. [From authors' summary.]

1920. Nepveu, P., and Vasseur, R. 632.753: 634/635
Sur la contaminabilité des plantes horticoles et spontanées par le pou de San-José (*Quadraspidiotus perniciosus* Comst.). **(The infestation of horticultural and wild plants with the San José scale insect.)**
C.R. Acad. Agric. Fr., 1946, No. 10, pp. 415-8.

The plants susceptible to infestation by the San José scale are included in the following categories: (1) fruit trees and shrubs, (2) ornamental and forest trees, (3) ornamental deciduous shrubs, (4) ornamental evergreen shrubs, (5) heath shrubs, (6) ornamental climbing plants. Rosaceous plants are among the most susceptible. Of fruit trees those showing the greatest infestation are: apricot, currants, cherry, gooseberry, medlar, walnut, peach, pear, apple, plum; less liable to be infested are almonds, chestnut, persimmon, fig. Raspberry and hazel nut are not attacked.

1921. Massee, A. M. 632.753: 632.96
Overwintering of woolly aphid parasite (*Aphelinus mali* Hald.) in low temperature apple stores.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 142-3.

The woolly aphid parasite can withstand winter temperatures without serious mortality, but damp conditions are unfavourable to its survival. A trial is described of overwintering it at low temperatures under cover. Apple shoots bearing parasitized aphids were collected in autumn (those bearing predators being eliminated) and laid in trays which were put in a cold storage chamber at 45° F. The trays were taken out the following May. The parasites began to emerge early in June and the shoots, with the newly emerged parasites, were then placed in an orchard infested with woolly aphids, the colonies of which became readily attacked. Practical instructions are given for

* Dinitro-ortho-cyclohexylphenol.

collecting and storing the shoots, and liberating the parasites in the spring.

1922. KUENEN, D. J. 632.753
Bloedluis: chemische en biologische bestrijding. **(Chemical and biological control of woolly aphis.)** *Tuinbouw*, 1946, No. 4, pp. 7-10.

Increase of woolly aphis infestation of apple trees in Holland during the war years is attributed to the scarcity of nicotine and to neglect of pruning. Control of the pest should now improve as nicotine becomes more available, but attention should be given to the woolly aphid parasite, *Aphelinus mali* Hald., as another means of control. Its life cycle is outlined and a method is described, based on work at the East Malling Research Station, of encouraging its breeding by cutting off infested shoots and keeping them under cover and under conditions that prove fatal to the aphid while allowing its parasite to survive so that it can be set free in the plantations at the appropriate time. The method is being tried in Holland by the author who collected infested material in November 1945, and a photograph shows the infested shoots in cold store at Goes in February 1946.

1923. NYSTERAKIS, F. 634.836.72: 577.17
Résistance des vignes américaines au phylloxéra et sensibilité de leurs cellules aux phytohormones. **(Resistance of American vines to phylloxera and the sensitiveness of their cells to phytohormones.)** *C.R. Acad. Agric. Fr.*, 1946, No. 10, pp. 444-6.

The formation of root and leaf galls in the vine is due to the injection by phylloxera of indol-β-acetic acid into the tissues of the various organs of the plant. The resistance of American vines and their hybrids to phylloxera is due chiefly to the low sensitiveness of their cells to the heteroauxin secreted by the insect. The differences of sensitiveness of the cells of the organs of the vine towards this substance, and the modification of that sensitiveness when the environmental conditions change, help to explain the apparent anomalies often recorded.

1924. DICKER, G. H. L. 634.11-2.76
The apple blossom weevil and its control. *A.R. East Malling Res. Stat. for 1945*, **A29**, 1946, pp. 140-1.

The life history of the apple blossom weevil is outlined and two recommendations for control are given: (1) Dust with 5% D.D.T. at bud burst and again a week later, using about 45-50 lb. per acre each time, or (2) Spray with 0·1% D.D.T. wash at bud burst.

1925. DICKER, G. H. L. 634.11-2.76
Apple blossom weevil and its control by D.D.T. *Ann. appl. Biol.*, 1946, **33**: 124-5.

The life cycle of the apple blossom weevil is outlined to show that control measures must be delayed until as many weevils as possible are on the trees before egg laying begins. Field experiments indicated that an adequate control can be obtained with a 5% D.D.T. dust if applied at the bud-burst stage and a week later. The applications are so early in the season that beneficial insects are unlikely to be affected. [See also *H.A.*, 16: 1399.]

1926. CHEVALIER, M. 634.11-2.76
Communication sur l'anthonome du pommier. **(The apple blossom weevil.)** *Fruit belge*, 1946, **14**: 55-9.

The control of the apple blossom weevil is said to be one of the most serious problems in producing regular yields of apples, especially dessert varieties. The stages of development of the pest are outlined and the factors conducive to heavy infestation are set out. Control measures are discussed under (*a*) the biological condition of the trees, particularly with reference to uniform development to facilitate more direct measures, (*b*) chemical measures. The latter are not defined specifically, but the newer sy thetic organic compounds are envisaged as having promising future.

1927. BARON, C. 634.11-2.76
Communication sur l'anthonome du pommier. **(Apple blossom weevil.)** *Fruit belge*, 1946, **14**: 28-31, bibl. 5.

Effective control of the apple blossom weevil can be obtain by applying, in favourable weather, a contact insecticid during the prenuptial feeding period, whatever the stage development of the flower buds may be. A table shows t stage of development of the flower buds of a number apple varieties at the time the weevils emerge from hibern tion. A simple method of ascertaining when the prenupti feeding begins is described. Hibernating weevils are plac in a cardboard box with a perforation in the lid throu which is passed a small glass tube plugged at one end. T box serves as a hibernation chamber, the tube as a promena for the weevils when they awake. The box is placed on tree in the plantation. A transparent cover, such as a lan glass, will protect the box from rain and snow.

1928. KUENEN, D. J. 634.13-2.76
Voorloopig verslag van enkele proeven ter bestrijding van den perebloesemsnuitkever (*Anthonomus cinctus*). **(Preliminary control trials against the pear blossom weevil.)** *Meded. Direct. Tuinb.*, 1946, pp. 525-30.

The morphological characters and the life cycle of the pe blossom weevil, *Anthonomus cinctus* Redt., are describe emphasizing the differences between it and the apple blossc weevil, *Anthonomus pomorum* (L.) Curt. Data are tabulat of spraying trials carried out in 1945, using Gesarol in la summer and early autumn. Three pairs of photograp taken in 1946 show the striking differences between spray and unsprayed trees.

1929. EBELING, W. 634.8-2.76
DDT for control of the grape bud beetle. *J. econ. Ent.*, 1945, **38**: 600, bibl. 1.

The grape bud beetle, *Glyptoscelis squamulata*, is a seric pest on grapes in the Coachella Valley, California, where feeds on the opening buds in early spring. A single appli tion of a 5% DDT dust or of a DDT-kerosene spray found to reduce bud destruction from 90% in untrea vines to 1·7%, while two applications gave practica complete protection.

1930. SNAPP, O. I. 634.22-2.768
Further experiments with dichloroethyl ether for plum curculio control. *J. econ. Ent.*, 1945, **38**: 417-8, bibl. 2.

Three years' experiments in commercial Elberta pea orchards near Fort Valley, Ga, following laboratory a cage tests indicated that soil treatment with dichloroet ether under the spread of the trees controlled plum curcu *Conotrachelus nenuphar*, as effectively as the regular sched of three lead arsenate sprays on the fruit, without caus injuries of any kind, while spray damage was severe. chemical was used in the form of an emulsion, at the rat about 1 gallon to 6 square yards of soil. The first appl tion was put on when almost all the curculios were pre as larvae and the second when most of them had becc pupae.

1931. WHITEHEAD, S. B. 634.13-2.77
The problem of pear midge. *Gdnrs' Chron.*, 1946, **120**: 6.

Spraying into the open flower trusses with a nico solution, as recommended by Massee, is in the auth view of only limited use for the control of the pear mi *Contarinia pyrivora*. Alternative methods suggested, a from destroying infected fruits, are frequent forking hoeing under the spread of the branches until the enc

uly or early August, or the application of a mulch, forming mat of rotting organic matter 4-6 in. thick by the end of ne year. This mat should be left in position until the end f May.

932. LINDBLOM, A. 634.11-2.78
Rönnbärsmalen 1945. **(The apple fruit miner in Sweden 1945.)**
Växtskyddsnotiser, 1946, No. 2, pp. 21-4.
he apple fruit miner is described as perhaps the most nportant apple pest in Sweden. Infestations vary from ear to year according to whether enough service tree berries *Prunus sorbus*]—the primary and preferred host—are vailable for the larvae. Control measures should be arried out in areas where the service berry crop failed and, particular, in orchards that are sheltered from the wind. he difficulty of timing the spray is discussed, which accounts r the sometimes indifferent success achieved with nicotine eatments. So far, trials with DDT have not been made, t its effectiveness against the apple fruit miner can be nticipated, since it is fatal to other *Argyresthia* species. hree applications are recommended, the first to be incorpor-ed in the early-summer spray, the second and third to be ade about 1st and 15th July.

933. BENNETT, S. M. 632.78
Some observations on the flight period of the codling moth (*Laspeyresia* [*Cydia*] *pomonella*) in Worcestershire during 1944 and 1945.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 140-3, bibl. 1.
he flight period varies with the season and spraying must varied accordingly.

934. VAN DEN BRUEL, W. E. 632.78: 634.11 + 634.13
Considérations sur la lutte contre le ver des pommes et des poires. **(Controlling codling moth.)**
Fruit belge, 1946, **14**: 59-67.
vere losses due to codling moth are quoted. The charac-rs and habits of the moth are described and emphasis is t on the necessity of a knowledge of its life cycle so that it n be attacked at the most vulnerable stages. The first terpillars appear about 8 days after the adult moths nerge; it would appear, therefore, that the best time for e first application of an insecticide is about 8 days after e appearance of the moths. It is concluded that control easures for apples include an application between petal-fall d the closing of the calyx lobes, and two others, one at the ginning and the other at the end of June. It is unneces-ry to give an arsenical spray to pears at petal fall because their early blossoming. The use of cages, for determining e date when the moths emerge, is advocated.

935. WHITEHEAD, F. E. 632.78
An effective method of controlling codling moth in Oklahoma orchards.
J. econ. Ent., 1946, **39**: 69-76, bibl. 5.
Oklahoma apple orchards, at the southern edge of the ple belt, codling moth reproduction is so much favoured climatic conditions, that control of the pest can hardly achieved by orthodox methods. In a study of the nparative number of codling moth larvae entering ernation on apple varieties of different ripening dates as found that only 9% of the total hibernating population l entered hibernation by 15 August, and that less than 2% ernated on trees maturing fruit by this date. In a detailed cussion of the *pros* and *cons*, the author comes to the clusion that the codling moth problem could be solved Oklahoma, if apple orchards were planted to varieties t are mature and harvested by 15 August. Concentration early apples seems sound advice also from other points view.—Oklahoma A. & M. College, Stillwater.

1936. ROSENBERG, G. 632.78
El D.D.T. y sus posibilidades en el control de la *Carpocapsa pomonella*. **(D.D.T. for the control of codling moth.)**
Agric. tec., Chile, 1944, **5**: 65-9.
Small field trials in Chile using D.D.T. at a concentration of 1‰ showed that it could be used to replace lead arsenate for the control of codling moth. The results suggest also that D.D.T. controls several species of leaf hoppers that attack apples. No injury was observed on the sprayed trees.

1937. STEINER, L. F., SUMMERLAND, S. A., AND FAHEY, J. E. 632.78
Experiments in 1945 with DDT for control of the codling moth.
Publ. Bur. Ent. Plant Quar. U.S. Dep. Agric., 1946(?), pp. 24, bibl. 6.
Most of the Bureau's 1945-work on codling moth control carried out at Vincennes, Ind.,* involved the study of DDT in the laboratory and in large-scale field tests. The results are discussed in an informal talk given at the annual meetings of the State horticultural societies of Illinois, Indiana, Kentucky and Ohio. The subjects reviewed include the influence of weather conditions, a comparison of different DDT spray programmes, large-scale tests in commercial orchards, problems in the use and development of DDT and preferential wetting of DDT by oil. The results leave no doubt that the insecticide is of outstanding promise for the control of codling moth, if intelligently used. At present, it will be particularly valuable to growers in areas where lead arsenate has been comparatively ineffective and where red spider is not likely to become a serious menace. "Until", it is concluded, "a safe and effective means of controlling mite outbreaks is developed, the use of DDT at low dosages in combination with other insecticides appears preferable to its use in larger quantities alone with oil." Full experimental data are presented.

1938. HARMAN, S. W. 632.78: 632.951
DDT for codling moth control in western New York in 1945.
J. econ. Ent., 1946, **39**: 208-10, bibl. 1.
For the second successive season DDT sprays have proved superior to lead arsenate for codling moth control without causing injury to fruit or foliage.—N. York St. Agric. Exp. Station.

1939. MARANI, M., AND ROSSI, L. 632.78: 634.11
Ricerche sull'impiego di un arseniato di zinco nella lotta contro il verme delle mele (*Laspeyresia pomonella* L.). **(Zinc arsenate against codling moth.)**
Riv. Fruttic., 1943, **7**: 96-7.
It is concluded that neutral zinc arsenate, though showing appreciable control of codling moth, is less effective than neutral lead arsenate.

1940. BESSON, —., and SCALA, —. 634.25-2.78
Observations sur les méfaites de la tordeuse orientale du pêcher (*Laspeyresia molesta* Busck.). **(The damage caused by the oriental peach moth.)**
C.R. Acad. Agric. Fr., 1946, No. 10, pp. 422-4.
The attacks of the oriental peach moth were more serious in 1945 than in previous years in the south-west of France, as the result of an exceptionally early spring and a late warm season. It appeared in April and there were four overlapping generations, the first two mostly in the shoots, the third on the late maturing peaches and the fourth causing multiple damage to young shoots, late fruits, and the inserted buds on budded trees, while severe injury occurred also in pear orchards. In September, as the fruit was removed, the caterpillars penetrated the bark of the lignified branches of peach, apricot and cherry, through injuries caused by budding and by hail. The cherry laurel (*Cerasus laurus cerasus* Juss.) was attacked in one locality near Bordeaux,

* See also *H.A.* 16: 1408.

causing wilting of the terminal shoots. Under experimental conditions the insect has been found capable of attacking grapes, the caterpillars entering the nearly ripe fruits and uniting them in pairs with a silken weft. A study of control measures is under way; the new organic insecticides would appear to be of great promise.

1941. DRIGGERS, B. F. 634.25: 632.951
DDT on peaches: three years field experiments.
J. econ. Ent., 1946, **39**: 181-3, being *Pap. J. Ser. N. Jersey agric. Exp. Stat., Dep. Ent.*

Three years' orchard spraying experiments with DDT used at the rate of 1 lb. DDT to 100 gallons water on peaches gave a high degree of control of oriental fruit moth larvae attacking the fruit. One spray application timed to control the late broods of larvae gave effective control on varieties harvested 3 to 6 weeks after the spray was applied. European red mite built up in large numbers following the DDT sprays and caused heavy defoliation in 2 out of the 3 years. [Author's summary.]

1942. WHEELER, E. H., AND LA PLANTE, A. A. 632.78: 632.951
DDT and *Ryanex* to control oriental fruit moth: their effect upon parasite populations.
J. econ. Ent., 1946, **39**: 211-5, bibl. 3, being *J. Pap. N. York St. agric. Exp. Stat.* **651**.

DDT and *Ryanex* were compared with each other, with natural parasitism and with areas where additional parasites were released for the control of the oriental fruit moth in peaches. Their effect upon both twig-infesting and fruit-infesting larval populations and their effect upon parasite populations were included in the study. Four sprays of DDT at 1 lb. actual toxicant to 100 gallons applied at 3-week intervals greatly reduced the number of twig-infesting larvae and also the rate of parasitism. *Ryanex* had a comparable effect for a shorter period. The DDT provided superior protection to the fruit. *Ryanex* did not exhibit the residual action of DDT but should provide protection if used at shorter intervals. No injury to foliage or fruit was observed, but an infestation of red spider mite appeared late in the season in the DDT blocks. [Authors' summary.]

1943. SNAPP, O. I. 634.25-2.78
Propylene dichloride for peachtree borer control: Second report.
J. econ. Ent., 1945, **38**: 419-22, bibl. 1.

For the first report on the successful control of the peach tree borer, *Sanninoidea exitiosa*, with propylene dichloride see *ibidem*, 1943, 36: 765-8; *H.A.*, 14: 600. Further experiments, carried out in commercial peach orchards at Fort Valley, Ga, in 1943 and 1946 confirmed earlier results that the chemical may be safely and at the same time effectively used.

1944. SMITH, C. F. 634.25-2.78
Reduced concentrations of ethylene dichloride for peachtree borer control.
J. econ. Ent., 1945, **38**: 500-1, being *Pap. J. Ser. N. Carolina agric. Exp. Stat.* **198**.

The data were obtained in commercial Elberta peach orchards in Moore and Richmond counties, Carolina, using various concentrations of ethylene dichloride, but a constant dosage of 8 fluid oz. per tree. Although concentrations of 20% were found to give the best control of the peach tree borer, weaker concentrations may be more satisfactory from a practical point of view, i.e. of injury and cost. In heavily infested orchards the 20% spray should be used the first year.

1945. RICHLI, K. 634.8-2.78
Bericht über die diesjährige Durchführung der allgemeinen Heuwurmbekämpfung im Rebberg Osterfingen. **(Report on the control of the vine moth *Cochylis ambiguella* in the Osterfingen vineyard in 1946.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 267-9.

Eighty growers combined to treat the area of the Osterfinge vineyard, Switzerland, as a whole for the purpose *Cochylis ambiguella* control. The spray used consisted 1½% bordeaux (against mildew and "rote brenner")+1 Gesarol (DDT)+0·1% spreader. The results showe 90-100% control of the pest, where the spray was applie at the rate of 2,000-2,500 litres per hectare. The almo complete destruction of the pest over the whole area expected to have a beneficial effect on the incidence of t second generation.

1946. NICKELS, C. B., AND PIERCE, W. C. 634.521-2.78
DDT and lead arsenate compared for control of the pecan nut casebearer.
J. econ. Ent., 1945, **38**: 607.

In field tests a lead arsenate plus zinc sulphate spray prove somewhat superior to DDT spray, with or without t addition of zinc sulphate, for the control of the pecan n casebearer, *Acrobasis caryae*, while in laboratory tests DD showed the greater toxicity. It is possible that the effectiv ness of the DDT-pyrophyllite mixture, used in the fie tests, was reduced because it did not mix well with water.

1947. PIERCE, W. C. 634.521-2.78
Timing spray applications to control the pecan nut casebearer.
J. econ. Ent., 1946, **39**: 76-8, bibl. 2.

In order to develop a simple method for timing spr applications against the pecan nut casebearer, *Acroba caryae*, observations on the beginning of egg laying w made near Brownwood, Texas. As a result it is suggest that spray applications be timed to begin 4-8 days af 85% of the catkins of certain protogynous varieties are sh About 25 trees in different parts of the orchard should used to determine this time.

1948. NICKELS, C. B. 634.521-2.78
DDT and lead arsenate compared for control of the pecan nut casebearer: 1945 tests.
J. econ. Ent., 1946, **39**: 272-3.

The data included in this paper indicate that DDT and l arsenate were equally effective in the control of a medi infestation of the first generation of pecan nut casebea and that DDT was much more effective than lead arsen and slightly better than a mixture of lead arsenate, nicot sulfate, and summer oil in the control of a severe infestat of the first generation of this insect. [Author's conclusio

1949. PHILLIPS, A. M. 634.521-2.78
An unusual habit of the pecan budmoth in Florida.
J. econ. Ent., 1945, **38**: 620.

A late brood of the pecan bud moth, *Gretchena bolliana*, migrated from the buds to the pecan nuts. Larvae pupae were found between the shuck and nut.

1950. JONCKHEERE, W. 632.793: 634.1/2
La tenthrède-limace des arbres fruitiers. **(The slug-worm of fruit trees.)**
Courr. hort., 1941, **5**: 287-8. [Received Aug. 1945.]

The fruit tree slug-worm *Caliroa limacina* was a real sco in Belgium in 1941, on pear and cherry trees. The and the damage it causes are briefly described. Its co is simple, cheap and easy. The most simple way i scatter on the leaves freshly slaked lime as a powder; d powder is also effective. Spraying may also be emplo e.g. 100 g. nicotine in 100 litres of water with a "stick added, or one of the arsenic products (3 recipes given)

1951. ROBIN, F., AND DUPREZ, R. 632.79
La lutte contre les frelons et les guêpes dans les vergers. **(Control of hornets and wasps in orchards.)**
Prog. agric. vitic., 1946, **126**: 76-80.

It is now possible to protect fruit crops, particularly p fruits, against attacks by hornets and wasps, by destro

ne nests and spraying the fruit with an insectifuge. The ests can be destroyed by placing about 6 g. (a spoonful) of alcium cyanide in their entrances; the wasps inside will ot emerge and those returning to the nest will collapse. or spraying the fruit a 1% solution of dichlordiphenyl-richlorethane is recommended; this appears to protect the uit for 10 to 15 days, a period just before picking time when ne fruit is most liable to attack. One application is enerally sufficient, but on certain very sensitive varieties, iat become liable to attack abnormally early, two applica-ons may be necessary.

952. TUNBLAD, B. 632.796
Ett par goda myrutrotningsmedel. (**Effective preparations for ant control.**)
Växtskyddsnotiser, 1946, No. 3, pp. 43-4.

he ant species used in these tests were *Formica rufa* and *asius niger*. A mixture of Gammexane and DDT dust, cattered liberally over ant heaps, has given very good esults. It is beneficial to use a mixture of the two insecti-ides, since the former acts more quickly and the latter has a onger residual effect.

953. CASHMORE, A. B., AND CAMPBELL, T. G. 632.5
The weeds problem in Australia: a review.
J. Coun. sci. industr. Res., 1946, **19**: 16-32, bibl. 42.

Veeds of cultivation, weeds of grazing areas and weeds of pecial crops and special habitats are dealt with, both in vinter and summer rainfall areas, and control measures y cultural, chemical and entomological means are discussed. Nearly all the papers cited in the bibliography were published n Australia.

954. HILDEBRAND, E. M. 632.954
War on weeds.
Science, 1946, **103**: 465-8, bibl. 24 on p. 492.

his is a review of recent work on weed control with particu-ar reference to certain growth-regulating substances or lant hormones as herbicides. It has been demonstrated iat 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-richlorophenoxyacetic acid (2,4,5-T) are selective herbicides. arly tests show that 1,000 p.p.m. and 500 p.p.m. of 2,4-D ere effective in killing perennial bindweed (*Convolvulus rvensis* L.) on nursery trees.

955. MARTÍNEZ CROVETTO, R. 632.5
Observaciones sobre las malezas de los cultivos en el partido de Balcarce. (**Weeds in the Balcarce district of the Buenos Aires province.**)
Rev. argent. Agron., 1946, **13**: 101-19, bibl. 10.

he author first makes a biological classification of the eeds with the object of determining methods of control, viding them into, I, those that are reproduced by seed only, id II, those that propagate themselves vegetatively by oloris, rhizomes and gemmiferous roots as well as seed, e former being sub-divided into (1) annuals, (*a*) spring owering and (*b*) summer flowering, and (2) perennials. e then groups them according to the crops among which ey grow, i.e. potato, maize, sunflower and sorghum; reals (wheat, oats, barley, rye and *Phalaris canariensis*); x, poppy and coriander; turnip and rape; alfalfa; chards and gardens; meadows and pastures. Thirty-five eeds are listed as occurring in orchards, and 27 in gardens.

956. BLACKMAN, G. E. 632.954
Selective weed control.
Farming, 1946, **1**: 5-10.

he author who was, under the Agricultural Research ouncil, in charge of a team of workers concerned in ethods of weed control during the war, gives a lucid count of progress made and problems to be faced. hough, as yet, there is no sovereign cure for all the mmon weeds that occur, say, in cereals, it is already ssible, by varying the material according to the dominant weed, to control the most important species. Thus 30 out of 32 annual weeds investigated in the U.K. can be destroyed by the use of one or other of the 4 types of spray, viz. sulphuric acid, copper chloride, di-nitro-ortho-cresol (D.N.O.C.) compounds and the two growth-promoting substances 2-methyl 4-chloro-phenoxyacetic acid (M.C.P.A.) and 2:4 dichloro-phenoxyacetic acid (D.C.P.A.). Weed control trials need repetition, since there is always the danger that initial success may not be confirmed in subsequent trials. Light paraffin oils have shown much promise for carrot and parsnip weeds, but their use is decidedly tricky and the active constituents have yet to be determined. Some paraffins kill the crop and the weeds, while others kill neither. In addition the roots may have a paraffin flavour. Some measure of success has been obtained with growth-promoting substances on perennial weeds such as creeping thistle, horsetail, ragwort, dandelion and buttercup—though not on dock—but results have been erratic, varying probably according to time of season and stage of growth when spraying takes place.

1957. TEMPLEMAN, W. G. 632.954: 577.15.04
Selective weed control by plant growth-promoting substances.
Agriculture, 1946, **53**: 105-8.

The paper summarizes the results of experiments, carried out with 2-methyl-4-chloro-phenoxyacetic acid (M.C.P.A.) on weed eradication in cereal crops. The chemical can be applied as a spray at the rate of 100 gallons per acre (or of 10 gallons per acre if an atomizer type of sprayer is used) and as a dust at the rate of 200 cwt. per acre, the weight of the active principle being made up by the addition of finely powdered dry chalk. The effect of M.C.P.A. on a list of annual and perennial weeds is recorded. While the weed killer was shown to be very successful with cereals, *Brassicae*, onions and field beans, among other crops proved very susceptible to light dressings. Potatoes were not so susceptible. See *H.A.*, 16: 836.—Jealott's Hill Research Station.

1958. HAMNER, C. L., MOULTON, J. E., AND TUKEY, H. B. 631.531.17: 577.17
Effect of treating soil and seeds with 2,4-dichlorophenoxyacetic acid on germination and development of seedlings.*
Bot. Gaz., 1946, **107**: 352-61, bibl. 3, being *J. Art. Mich. St. Coll., Hort. Dep.* **795**, n.s.

The authors' results open up new perspectives for weed control by soil treatment with growth substances. Weed-infested muck soil, for instance, was treated with 2,4-D in a 0·5% Carbowax 1,500 solution at the rate of 1, 10 and 100 mg. of the acid per 1,000 g. muck containing 36% water. The 1 p.p.m. concentration was found to reduce weeds by 80% after 4 weeks, as compared with the checks, while soils to which the higher concentrations had been applied remained weed-free. Peas and beans planted in muck 3 weeks after treatment with 100 p.p.m. 2,4-D exhibited slight symptoms of a toxic effect, whereas seeds planted 4 weeks after treatment grew quite normally. Equally promising results were obtained with growth substance applications to Upland soil and manure. Grass seeds were found to be more resistant to the acid than many other seeds. The concentrations required to inhibit the growth of seeds of a number of plant species are tabulated.

1959. HAMNER, C. L., AND TUKEY, H. B. 632.954: 577.17
Herbicidal action of 2,4-dichlorophenoxyacetic acid on several shrubs, vines, and trees.*
Bot. Gaz., 1946, **107**: 379-85, bibl. 4.

1. Experiments were conducted in the immediate vicinity of Geneva, New York, between 20 April and 15 July, 1945, using several formulations of 2,4-dichlorophenoxyacetic

* See also 1749.

acid as a herbicide applied as a water spray at concentrations of 1,000 and 2,000 p.p.m. to certain shrubs, vines, and trees. Concentrated salves of these materials were also applied to cut surfaces. 2. Applications as a foliage spray at 2,000 p.p.m. during a warm period (80°-85° F.) in early April at the time of leaf emergence resulted in death of chokecherry, honeysuckle, poison ivy, sumac, hawthorn, and elm after 3 weeks. No effect was observed on juniper. 3. Applications as a foliage spray at 2,000 p.p.m. during a cool period (below 50° F.) in late April resulted in marked reduction in response. Death of sumac, chokecherry, honeysuckle, hawthorn, and elm did not occur until a warm sunny period in June. Fifty per cent. of the poison ivy treated in late April completely recovered. No effect was observed on juniper. 4. Application to cut surfaces in early spring in the form of concentrated salves resulted in typical curvatures, browning and necrosis of leaves, exudation of gum, proliferation of the inner bark, and death of the entire plant, provided sufficient active material was used on the cut surfaces. 5. Application as a water spray in June at 1,000 and 2,000 p.p.m. resulted in death of the above-ground parts of Virginia creeper, grape, willow, chokecherry, and honeysuckle. 6. Application to hawthorn in June, when the leaves were fully expanded and mature, resulted in blackening of the growing tips but not death of the entire plants. [Authors' summary.]

1960. Crafts, A. S. 632.954
Selectivity of herbicides.
Plant Physiol., 1946, **21**: 345-61, bibl. 23.
The chemicals used as selective weed killers are reviewed and future possibilities are assessed. Of the factors on which selectivity of a herbicide may be based differences in chemical tolerance seem to offer most promise. As new effective compounds are discovered, more crops will come within the scope of the treatment. It is suggested that cruciferous crops, beet and mangel crops, and composites of the lettuce type should receive more attention.

1961. Marth, P. C., and Mitchell, J. W. 632.954
Period of effective weed control by the use of 2,4-dichlorophenoxyacetic acid.
Science, 1946, **104**: 77-9, bibl. 3.
Trials have shown that a weed-free lawn can be maintained by a few applications of 2,4-dichlorophenoxyacetic acid, the first to eradicate established weeds, the following to kill subsequently germinating seedlings. No spray injury to the grass occurred, the concentration of the chemical having been 125-1,000 p.p.m. An interesting aspect of these experiments is that 2,4-D was also applied as a dust with a 10-6-4 fertilizer as a carrier. An addition of 6 and 9 lb. of the dust to 600 lb. of the fertilizer mixture gave promising results.

1962. Ministry of Agriculture, London. 632.693.2
Rats and how to destroy them.
Bull. Minist. Agric. Lond. **30**, 7th edition, 1945, pp. 17, 6d.
Descriptions of the black and brown rats (*Rattus rattus* and *R. norvegicus* respectively) and their habits are followed by suggestions on how to prevent access and on methods of extermination, if infestation occurs. These consist of poisoning, gassing, trapping and hunting. The use of viruses is not recommended on the grounds that it is uncertain of success and a slightly infected rat may recover and become immune, and also because there is a risk of infecting other animals. Notes are also given on control of house mice, grey squirrels, etc.

1963. Steinhaus, E. A. 632.96
Insect pathology and biological control.
J. econ. Ent., 1945, **38**: 591-6.
In this paper read to the Entomological Club of Southern California in June, 1945, the author discusses biological insect control by micro-organisms, particularly bacteria, protozoa and viruses, and demands the recognition of insect pathology as a distinct field for future research.

1964. Durán M., L. 632.96
Primer ensayo de importacion de insectos beneficos de Europa a Chile. **(The first trials of importing into Chile beneficial insects from Europe.)**
Agric. tec. Chile, 1944, **4**: 57-8.
The author describes the successful introduction into Chil of *Stethorus punctillum*, a natural parasite of the red spide *Tetranychus telarius*. Parasitized red spiders were collecte from a lime tree near Berlin in August, 1939, and despatche the next day by aeroplane to Santiago where they arrive a week later.

1965. Durán M., L. 634.63-2.752-2.96
Un enemigo natural de la *Saissetia oleae* (Bern.) nuevo para Chile. **(A natural enemy of *Saissetia oleae* new to Chile.)**
Agric. tec. Chile, 1944, **4**: 255-6.
The occurrence of *Metaphycus lounsburyi* (How.), a natura enemy of the black scale, *Saissetia oleae*, of olives an oranges, is recorded for Northern Chile.

1966. Durán M., L. 634.63-2.752
Otro enemigo natural de la *Saissetia oleae* (Bern.) nueva para Chile. **(Another natural enemy of *Saissetia oleae* new to Chile.)**
Agric. tec. Chile, 1944, **5**: 98-9.
Records finding *Metaphycus helvolus* parasitizing the blac scale insect on olive branches received by the author fro the Azapa valley.

1967. Clausen, C. P. 632.96
International aspects of biological control of insect pests. [Spanish summary.]
Agric. tec. Chile, 1944, **4**: 245-51.
The biological control of insect pests involves utilizing the natural enemies, in order to reduce infestations to a economic level. This work more than any other impli a close international co-operation. Such co-operatio includes interchange of information on the presence c natural enemies of the important pests of cultivated plant when a parasite or predator is shown to be exceptional effective, the fact should be communicated to all tho countries that suffer from that particular pest. Th international co-operation includes, moreover, drawing u common programmes or plans for control, so that the may be carried out more effectively and economically. T special value of such co-operation, with reference to t control of pests of horticultural crops in the South America countries, is emphasized.

1968. Gilliver, K. 632.96: 632.3 + 632.4
The inhibitory action of antibiotics on plant pathogenic bacteria and fungi.
Ann. Bot. Lond., 1946, **10**: 271-82.
The inhibitory powers of 13 antibiotic substances on organisms causing plant diseases have been investigate Bacteria on the whole were inhibited by more substanc and at higher dilutions than fungi. Of the substanc tested claviformin, gliotoxin, penicillin, tyrothricin, cheir line and aspergillic acid might be useful in the control plant diseases caused by certain pathogenic bacteria a fungi.

1969. Lucas, E. H., Lewis, R. W., and Sell, H. M. 632.96: 632.3
An antibiotic principle derived from seeds of *Brassica oleracea*.
Quart. Bull. Mich. agric. Exp. Stat., 1946, **29**: 4-6, bibl. 12.
The antibiotic principle extracted from cabbage seed w found to be of considerable potency. It has bacteriosta as well as bactericidal properties and inhibits the growth

certain pathogenic and other fungi. The active substance is believed to be a mustard oil, though probably not identical with any of those recognized as most toxic to micro-organisms.

1970. Johns, M. E., Philpot, F. J., and Pollock, A. V. 632.96: 632.4
Moulds producing penicillin-like antibiotics.
Nature, 1946, **158**: 446, bibl. 16.
A further 5 species of *Penicillium* were shown to produce penicillin-like antibiotics.—Sir William Dunn School of Pathology, University of Oxford.

1971. Bose, S. R. 632.96: 632.4
Antibiotics in a *Polyporus (Polystictus sanguineus).*
Nature, 1946, **158**: 292-6, bibl. 15.
The source of the new bactericide polyporin, discussed and studied by the author, is the tropical fungus *Polystictus sanguineus*, growing on logs and bamboo pieces. The experimental use of crude polyporin in Calcutta hospitals seems to justify the hopes placed in this substance. No adverse effect was observed as a result of the treatment.—Carmichael Medical College, Calcutta.

1972. Meyer, K., Hahnel, E., and Steinberg, A. 632.952
Lysozyme of plant origin.
J. biol. Chem., 1946, **163**: 733-40, bibl. 7.
The paper deals chiefly with the mucolytic enzyme ficin found in the latex of *Ficus glabatra* and *F. doliana*, though papain has also been investigated. The *Ficus* lysozyme is chemically distinct from the enzyme prepared from egg white and has a more limited range of antibacterial activity.

1973. Smith, F. G., Walker, J. C., and Hooker, W. J. 632.952
Effect of hydrogen-ion concentrations on the toxicity to *Colletotrichum circinans* (Berk.) Vogl. of some carboxylic acids, phenols, and crucifer extracts.
Amer. J. Bot., 1946, **33**: 351-6, bibl. 31.
It was observed that the toxicity of ether-soluble, strong acid fractions of crucifer extracts was correlated with pH. A study of the variation in toxicity with pH of extracts and several typical phenols and carboxylic acids was made by determining the per cent. spore germination. Plotting logarithms of LD50 values against pH gave characteristic curves for each group of toxicants. The carboxylic acids showed nearly parallel linear curves with toxicity decreasing in order: benzoic, protocatechuic, and acetic acids. Hydroquinone and catechol showed distinctly different curves than the acids. The curves for crucifer extracts indicated that carboxylic acids or similar toxicants are largely responsible for toxicity. [From authors' summary.]

1974. Kearns, H. G. H., Marsh, R. W., and Martin, H. 634.11-2.951
Experimental spraying programmes on apples at Long Ashton: Season 1945.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 132-40, bibl. 1.
The main purpose of this trial was to examine the effect on pest population of repeated applications of D.D.T. Three acres of Worcester Pearmain, Lane's Prince Albert and Laxton's Superb apples, left unsprayed in the winter of 1944-45, were sprayed three times with D.D.T. between 24 March and 19 May, 1945. Control trees were sprayed at the same times with lime-sulphur only. On half the trees receiving D.D.T. the insecticide was applied in an oil emulsion wash; on the other half it was applied as a suspension. Comparisons of three fungicides—tetramethyl-thiuramdisulphide, ferric dimethyldithiocarbamate and copper sebacate—were also included. On the trees sprayed with lime-sulphur only, a serious attack of leaf-curling aphis developed, 51% of the trusses being infested; on the D.D.T.-sprayed trees the infestation was only 2-4%. The trials indicated that the D.D.T. applied at the pink stage had the most important effect in aphis control. Red spider infestation was highest on the plots sprayed with D.D.T. without oil and lowest in the oil-sprayed plots. On the plot sprayed with lime-sulphur (without spreader) infestation was moderate. The application of oil at the fruitlet stage caused appreciable leaf damage to all varieties, especially Lane's Prince Albert. This phytocidal effect may have been enhanced by the low state of vigour of the sprayed trees. The organic sulphur fungicides proved compatible with oil but less effective than lime-sulphur in scab control. Copper sebacate was approximately equal to lime-sulphur as a fungicide but may be damaging to copper-sensitive varieties. [Authors' summary.]

1975. Kearns, H. G. H. 634.1/7-2.95
Hydraulic spraying machinery for fruit crops. The choice of power equipment.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 110-32.
After briefly discussing different spraying systems, i.e. underground mains and mobile outfits, and stressing the necessity for a knowledge of the life history or habits of the pest or fungus which needs control, the author deals in considerable detail with the choice of power spray equipment, both stationary and mobile, and then describes the broad specifications which should be in the mind of potential purchasers and manufacturers of spraying equipment for fruit crops with reference to the chief components of hydraulic equipment, dealing specifically with each component in turn.

1976. Committee of the Agricultural Improvement Council. 634.1/7-2.95
Fruit spraying machinery. Broad specifications for power machines.
Agriculture, 1946, **53**: 203-7.
The article is intended as a general guide for purchasers and manufacturers of fruit spraying equipment. A strong plea is made for limiting the range of models to those that meet the widest range of use. Different types of spraying machines are described. The figures presented are based on the need for applying a minimum of 500 gallons of wash per acre of medium-size fruit trees and for covering the total acreage at petal fall within a maximum period of 10 days, often reduced to 7 days or less. "A tractor-trailer outfit with a delivery of 17-20 g.p.m., 200-300 gallon tank and two 'walk behind' spraymen will be able to apply on an average 1,500-2,000 gallons per day, the outfit fetching its own wash. This will cover about 20-40 acres over the whole petal-fall period. At each of the green-cluster and pink-bud stages approximately the same acreage can be sprayed, provided the weather is satisfactory. During the winter a total of 100 acres can be sprayed on about 30-35 suitable spraying days. Smaller acreages can be sprayed by smaller outfits. An outfit with a rated delivery of 10 g.p.m. can apply 60-70%, and the 3-5 g.p.m. small outfit about 40%, of the volume supplied by the 17-20 g.p.m. outfit." The underground mains system, though requiring a higher initial capital outlay, is more economic of time and labour and allows of taking full advantage of favourable weather. "As a rough guide it may be calculated that from 50-75% of the total hourly delivery of the pump, when used with underground mains, should be available for spraying; thus a 17-20 g.p.m. pump should allow the application in a 6-hour period of approximately 3,000-4,500 gallons, i.e. 6-9 acres." The technical discussion of components of spraying machinery includes pumps, tanks, axle equipment, injector, hoses, hose couplings, lances and nozzles.

1977. S., J. M. L. 632.95: 634.1/7
Een engelsche sproeikalender voor boomgaarden en fruittuinen. (**An English orchard spray calendar.**)
Cult. Hand., 1946, No. 6, pp. 16-7.
This is a reprint (*J. Roy. hort. Soc.*, 1940, 65, pp. 61-2) of a spray calendar condensed from that issued by the East Malling Research Station, together with comments by the author, contrasting in some respects the recommendations with those practised in Belgium.

1978. STAHEL, M. 634.1/7-2.76
Sommerarbeiten bei Jungbäumen. (**Summer care of young fruit trees.**)
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 251-5.
The routine work discussed includes destruction of cockchafer larvae in the region of the roots. Emulsified carbon disulphide often causes injury to the tree, but recent experiments with a new gammexane preparation (941) have given promising results. Cockchafer beetles are controlled by a 1·5-2% Gesarol (DDT) spray or by dusting with a Gesarol preparation.

1979. LECRENIER, A. 634.1/7-2.95
La culture fruitière et la question des pulvérisations. (**Orchard spraying.**)
Fruit belge, 1945, **13**: 118-22.
Discusses the factors underlying fruit-tree spraying. It is emphasized that to obtain the best results a knowledge is necessary of the biology of the parasites so that the applications can be made at the most effective times, and of the cultural conditions indispensable for the health of the trees.

1980. VAN CAUWENBERGHE, E. 634.1/7-2.95
Le traitement hivernal des arbres fruitiers. (**Winter treatment of fruit trees.**)
Fruit belge, 1945, **13**: 130-7.
A short general account of winter spraying with reference to petroleum oils, tar oils, and yellow oils, the stages of tree development at which to make the applications being described and illustrated by drawings.

1981. SIAENS, F. 634.1/7-2.95
Les pulvérisations post-florales. (**Post-blossom spraying.**)
Fruit belge, 1945, **13**: 146-56.
The aims of spraying, its timing, the products used in relation to the crop, climate and orchard equipment, and the form of the jet for post-blossom spraying are set out. The diseases and pests that yield to post-blossom treatment are listed for apple, pear, plum, peach and cherry. A spray programme with remarks is tabulated for apple, pear and plum. A reference is made to pre-harvest spraying to prevent premature fruit drop, and a list is given of varieties of apple and pear that have responded favourably to the treatment in Holland and Belgium.

1982. MARTIN, H. 634.1/2-2.951
Was the winter spraying of your fruit trees successful ?
Farming, 1946, **1**: 55-8.
Practical directions for deciding in early summer from incidence of aphis, sucker, caterpillar, capsid and red spider whether winter washing has been successful, and, if not, where it may have gone wrong.

1983. BARRATT, R. W. 632.952
A laboratory assay for stability of organic fungicide residues.
Abstr. in *Phytopathology*, 1946, **36**: 679.
Laboratory assays have been designed to measure the following factors which cause failure of fungicides in the field: tenacity, previous material in the spray tank or additives, decomposition during application and decomposition of the spray residue from ultraviolet light, leaf exudates, atmospheric gases, rain water, and soil on leaves. The technique involves the spraying of coated glass slides in a dosage series employing a dose ratio of 2 or $\sqrt{2}$.

1984. PALMITER, D. H., AND OTHERS. 634.11: 581.45: 632.95
Apple leaf structure in relation to penetration by spray solutions.
Abstr. in *Phytopathology*, 1946, **36**: 681.
Spray solutions containing minor elements, nitrogen, hormones, and organic fungicides, when applied to apple foliage, have given results showing that they had penetrated the leaves, and the question as to how penetration occurred is discussed, based on the fact that the apple leaf cuticle is not a solid mass of cutin but a laminated tissue composed of discontinuous layers of cutin, cellulose and pectic materials.

1985. THURSTON, H. W., Jr., AND HARRY, J. B. 632.952
Glyoxalidine derivatives as foliage fungicides: field studies.*
Abstr. in *Phytopathology*, 1946, **36**: 683.
On apples, all three of the glyoxalidines tested gave scab control equal to the standard lime-sulphur spray. They caused less injury, especially to the foliage, and satisfactory colour and finish to the fruit. The 2-heptadecyl glyoxalidine was compatible with lead arsenate, nicotine sulphate, and summer oil on apples and four years' consecutive trials showed it to be superior to other fungicides tested, including 2-8-100 bordeaux in controlling the defoliation of sour cherries (Montmorency) caused by leaf-spot [*Coccomyces hiemalis*].

1986. BRETT, C. H. 633.862.4: 632.951
Insecticidal properties of the indigobush *(Amorpha fruticosa).*
J. agric. Res., 1946, **73**: 81-96, bibl. 13.
The pods of the indigobush were found to contain in resinous pustules an insecticidal glycoside that reacts to the rotenoid tests. The active principle has not yet been determined; provisionally it is designated as amorpha. In preliminary laboratory and field tests, dusts and sprays containing the new substance have been tried against 29 species of insect or mite, including a number of horticultural pests, partly with good success. Amorpha acts both as a stomach and as a contact poison; its repellency to certain insects is an interesting feature. The toxicity of amorpha to mammals has not yet been studied.—Oklahoma Agricultural Experiment Station.

1987. BUSVINE, J. R. 632.951
New synthetic contact insecticides.
Nature, 1946, **158**: 22, bibl. 3.
Gammexane and some new German insecticides are compared with DDT in their effectiveness against body lice and bed bugs.—London School of Hygiene and Tropical Medicine.

1988. POTTER, C., AND GILLHAM, E. M. 632.951
Effects of atmospheric environment, before and after treatment, on the toxicity to insects of contact poisons. I.
Ann. appl. Biol., 1946, **33**: 142-59.
The test insect was the beetle *Tribolium castaneum* Hbst. and the poisons used were (1) pyrethrins, (2) lauryl thiocyanate, (3) nicotine—all in aqueous medium, (4) dinitro-cresol in ethylene glycol, (5) Wakefield half-white oil, (6) D.D.T. in Wakefield half-white oil.

1989. FINNEY, D. J. 632.951
The analysis of a factorial series of insecticidal tests.
Ann. appl. Biol., 1946, **33**: 160-5.
The purpose of this paper is to suggest that, when tests ha

* See also 2010 p.

been made with all combinations of several factors, standard methods for the statistical analysis of factorial experiments may be adapted to the examination of the relative potencies.

1990. TUNBLAD, B. 632.951.9
Till debatten om karbolineumpreparaten. (**On carbolineum preparations.**)
Växtskyddsnotiser, 1946, Nr. 3, pp. 36-40.

This is a further contribution to the discussions on carbolineum preparations available on the Swedish market (see *ibidem*, 1945, No. 2, pp. 17-9; *H.A.*, 16: 159), supported by tabulated data of trials carried out at the Plant Protection Station, Stockholm, during the winter 1945/46. The sprays were tested at various concentrations against apple sucker (*Psylla mali*) and red spider eggs. Foreign DNOC preparations and Hibernol, an emulsified carbolineum, proved superior to Swedish products. Among Swedish oil emulsions tested in spring against red spider eggs, Vinterolja Jofur gave a kill of 90-95% at a concentration of 3-5%. The preparation is recommended against red spider, where aphis and apple sucker infestation is not severe.

1991. ROARK, R. C. 632.95: 631.8
Feeding chemicals to plants and animals for pest control.
J. econ. Ent., 1946, **39**: 35-8, bibl. 12.

Various attempts are recorded of protecting plants against pests and fungus diseases by injecting chemicals, a large number of which have been tested for the purpose. The only results so far achieved were obtained with selenium against certain aphids and red spider, but this course was not pursued any further because of the high toxicity of selenium to man and mammals. Experiments with derris powder show that the search for suitable substances need not be confined to chemicals readily soluble in water, since insoluble derris constituents were found to be translocated in a bean plant.

1992. ABBOTT, C. 632.952.1
The toxic gases of lime-sulphur.
J. econ. Ent., 1945, **38**: 618-20, bibl. 6.

It is shown that the insecticidal action of lime-sulphur depends primarily on the presence of hydrogen sulphide.

1993. ISELY, D., AND MINER, F. D. 632.753: 632.951
Sulfur as an aphicide.
J. econ. Ent., 1946, **39**: 93-4, bibl. 5, being *Res. Pap. J. Ser. Univ. Ark.* **808.**

Sulphur is effective as a contact insecticide against a number of species of aphids. Its usefulness is yet to be determined by further experiments. Its effectiveness seems to be dependent upon obvious contact with the aphids and upon a temperature of about 70° F. or higher. It is relatively slow in action. In addition to its possible use as a primary insecticide, sulphur might well be more generally recommended as a diluent for other insecticides. [From authors' conclusions.]

1994. HARING, R. C. 632.951
Azobenzene as an acaricide and insecticide.
J. econ. Ent., 1946, **39**: 78-80, bibl. 5.

Commercial parasiticides using azobenzene as the active ingredient have been developed. These compositions like other parasiticides, are specific in their action. The use of dusts containing 20% of azobenzene in whiting or bentonite results in the complete control of several species of economically important pests. These dusts are particularly effective against red spider mite and the Mexican bean beetle, which have previously been difficult to control. [Author's summary.]

1995. NEERGAARD, P. 632.951
Praktiske Erfaringer med Idosect-Sprøjtevaedske i 1944. (**Practical experiences with the insecticide Idosect in 1944.**)
Beretn. J. E. Ohlsens Enkes plantpatol. Lab., Copenhagen, 1945, pp. 9.

This paper on the new Danish insecticide, Idosect, is based on about 200 reports received from market gardeners and gardeners in Denmark. The composition of the chemical, which is used at a concentration of 1-2%, is: Pentachlordiphenylethane, 5%; solvent and emulsifier, 13%; water, 5%. Idosect has proved effective against many aphid pests of economic and ornamental plants, which are named, while it has failed to control the aphids *Hyalopterus pruni*, *Lachnus fagi* and a few other species that are protected by a wax coat. The insecticide is a slow-acting contact poison; it can be mixed with many other insecticidal or fungicidal sprays. No scorching effect has been observed.

1996. HELSON, G. A. H., AND WATERHOUSE, D. F. 632.951
The present status of D.D.T. as an insecticide.
J. Aust. Inst. agric. Sci., 1945, **11**: 172-8.

This is a review of present knowledge of the application of DDT and of the results achieved. It discusses the forms in which DDT may be used, methods of application, its toxicity to insects and to higher animals and to plants. A list is given of those horticultural insect pests that may be controlled by either dusts or sprays, those controlled only by dusting and those only by spraying.

1997. HELSON, G. A. H., AND GREAVES, T. 632.951
The use of D.D.T. as an agricultural insecticide. Results of trials, 1944-45.
J. Coun. sci. industr. Res. Aust., 1945, **18**: 301-9, bibl. 3.

The results of trials on the use of D.D.T. showed that it gave effective control of a number of pests, e.g. green vegetable bug, *Nezara viridula* L.; bean aphid, *Doralis fabae* Scop.; black peach aphid, *Anuraphis persicae-niger* Sm.; green peach aphid, *Myzus persicae* Sulz.; potato aphid, *Macrosiphum gei* Koch; Oriental peach moth, *Cydia molesta* Busck.; codling moth, *Cydia pomonella* L.; potato moth, *Gnorimoschema operculella* (Zell.); cabbage centre grub, *Hellula undalis* (Fabr.); cabbage cluster grub, *Crocidolomia binotalis* Zell.; common cluster grub, *Prodenia litura* Fabr.; corn earworm, *Heliothis armigera* Hubn.; cabbage moth, *Plutella maculipennis* Curtis; cabbage butterfly, *Pieris rapae* L.; pear slug, *Caliroa limacina* de Geer; and certain ants. This list contains certain species which could not be controlled adequately by insecticides used previously. On the other hand, a few pests proved to be resistant to D.D.T. in the preparations used, notably cabbage aphid, *Brevicoryne brassicae* L.; woolly aphid, *Eriosoma lanigerum* Hausm.; and red spider, *Tetranychus urticae* Koch. [Authors' summary.]

1998. SHAW, H. 632.951: 634.1/7
General considerations in the use of D.D.T. against fruit pests.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 138-9.

This is a review in popular language of the possible application of D.D.T. in the control of fruit tree pests. Its limitations are discussed—its outstanding failure is against the fruit tree red spider, while certain useful predator and parasitic insects are very easily killed—and precautions necessary in using it are pointed out.

1999. TILEMANS, E. 632.951: 634.1/7
Un nouvel insecticide: le D.D.T. (**A new insecticide, D.D.T.**)
Fruit belge, 1945, **13**: 106-9.

DDT and its form sold under the name Gesarol are discussed in relation to their application in horticulture. Against aphids and red spider the results have been disappointing, but good control has been obtained against thrips, peach moth (*Anarsia lineatella*), apple weevil and codling moth.

2000. KULASH, W. M. 638.14: 632.951
DDT and "control" of honey bees.
J. econ. Ent., 1945, **38**: 609-10, bibl. 1.

DDT effectively eradicates out-of-the-way bee colonies,

but the insecticide should be used only if no danger to nearby hive bees arises.

2001. HACKMAN, R. H. 632.951
The preparation of some emulsions containing DDT.
J. Coun. sci. industr. Res. Aust., 1946, **19**: 77-85, bibl. 6.
The special interest of this paper lies in the formulae presented of soluble oil concentrates containing DDT, made from materials available in Australia.

2002. LEEFMANS, S. 632.951
Voorzorgen bij het gebruik van DDT. **(Precautions in using DDT.)**
Meded. Direct. Tuinb., 1946, pp. 537-9.
A discussion and summary of the "Recommended Uses of DDT", issued by the U.S. Department of Agriculture, Agricultural Research Administration, as set out by the Bureau of Entomology and Plantquarantine.

2003. WOLCOTT, G. N. 632.732
DDT as a termite repellant.
J. econ. Ent., 1945, **38**: 493.
Impregnation of wood with 2% DDT solution seems to confer immunity from termite attack extending at least over the service life of the treated wood.—Agricultural Experiment Station, University of Puerto Rico.

2004. COHEN, M. 632.951
Experiments with D.D.T. smokes.
Ann. appl. Biol., 1946, **33**: 125-6.
Experiments here described show that paper impregnated with D.D.T. will burn to produce a smoke which is insecticidal both before and after settling.

2005. MANALO, G. D., HUTSON, R., AND BENNE, E. J. 632.951: 634.1/8 + 635.1/7
DDT residues on fruits and vegetables.
Quart. Bull. Mich. agric. Exp. Stat., 1946, **28**: 272-9.
Examination of a variety of fruits and vegetables treated with DDT dusts and sprays showed that the amount of DDT residue at the time of harvesting is not strictly related either to the number of applications made or to the length of time elapsing between the last application and harvest. Caution is therefore advised. The technique of determining residual DDT is discussed.

2006. MANALO, G. D., AND OTHERS. 634.11-2.951
Removal of DDT spray residues from apples.
Quart. Bull. Mich. agric. Exp. Stat., 1946, **29**: 15-22, bibl. 9.
All the treatments used for the removal of DDT spray residue from apples left about 75% of the insecticide on the peel, the rest being chiefly mechanically dislodged. In order to remain within the tolerance limit of 7 mg. per kg. of fruit [in the U.S.A.], it will be necessary to economize in the number of applications and in the amount of spray applied.

2007. LINDQUEST, A. W., JONES, H. A., AND MADDEN, A. H. 632.951: 612.014.44
DDT residual-type sprays as affected by light.
J. econ. Ent., 1946, **39**: 55-9.
It appears from these tests that in general, where decomposition by light may be a factor, auxiliary solvents used in conjunction with kerosene in DDT residual sprays should not only be good solvents for DDT but should be of the boiling range of kerosene or lower. Solvents of very low flash point should be avoided. Xylene emulsions and aqueous suspensions were less affected by light than solutions. [From authors' summary.]

2008. ADAM, W. B., DICKINSON, D., AND MARSH, R. W. 664.85.723.036.5: 632.952
Effect of dithiocarbamate spray residues on canned blackcurrants.
A.R. Fruit Vegetable Pres. Res. Stat. Campden, 1945, 1946, pp. 40-50, bibl. 3.
The conclusions to be drawn from the canning trials are that ferric dimethyldithiocarbamate spray residues are not harmful to the colour, flavour, ascorbic acid content or shelf-life of canned blackcurrant pulp, but may seriously affect the flavour of canned whole currants in syrup. As boiling the fruit causes ferric dimethyldithiocarbamate to decompose rapidly, it seems probable that this spray could be safely used for currants which will subsequently be stewed, or made into jam or pulp. It cannot be recommended for fruit required for canning as dessert currants in syrup. [From authors' summary.]

2009. DE ONG, E. R. 634.21-2.951
Injury to apricot leaves from fluorine deposit.
Phytopathology, 1946, **36**: 469-71.
Injury to orchards in the vicinity of an aluminium reduction plant is reported. Many of the broad-leaved plants were blackened and a few English walnut trees and apricot trees within one-half mile of the plant were almost defoliated by the end of July. Apricot foliage still remaining on the trees was red brown, and the outer edges of the leaves were dead.

2010. BAER, H., HOLDEN, M., AND SEEGAL, B. C. 632.952

a **The nature of the antibacterial agent from *Anemone pulsatilla*.**
J. biol. Chem., 1946, **162**: 65-8, bibl. 7.

b BUSTON, H. W., JACOBS, S. A., AND GOLDSTEIN, A. 632.951
Cause of physiological activity of "Gammexane".
Nature, 1946, **158**: 22, bibl. 4.

c CHISHOLM, R. D., AND KOBLITSKY, L. 632.76
Variation in composition and volatility of Japanese beetle attractants during evaporation.
J. econ. Ent., 1945, **38**: 467-70, bibl. 3.

d FROST, S. W. 634.23-2.754
A new leafhopper on cherry.
J. econ. Ent., 1945, **38**: 617-8, bibl. 3.
Cicadella stellulata on sour cherry in Pennsylvania.

e GINSBURG, J. M. 632.951
Chemical methods for analysis of dichlorodiphenyl-trichloroethane (DDT).
J. econ. Ent., 1946, **39**: 174-7, bibl. 19, being *Pap. J. Ser. N. Jersey agric. Exp. Stat., Dep. Ent.*

f GOBLE, G. J., AND PATTON, R. L. 632.951: 638.14
The mode of toxic action of dinitro compounds on the honeybee.
J. econ. Ent., 1946, **39**: 177-80, bibl. 9.

g HORSFALL, J. G., AND OTHERS. 632.952
Distinguishing permeation from toxicity of fungicides.
Abstr. in *Phytopathology*, 1946, **36**: 680.

h HORSFALL, J. G., AND OTHERS. 632.95
Interactions of concentration, pressure, time and orifice in spraying.
Abstr. in *Phytopathology*, 1946, **36**: 680.
Experiments on potatoes and beans.

i JENNY, J. 632.95
Die stationären Spritzanlagen. **(Stationary spraying plants.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 256-60.
A survey, supported by diagrams and photos.

j LANGFORD, G. S., AND CORY, E. N. 632.76
Japanese beetle attractants with special reference to caproic acid and phenyl ethyl butyrate.
J. econ. Ent., 1946, **39**: 245-7, bibl. 3.

k LINDGREN, D. L., AND SINCLAIR, W. B. 632.944
Sorption of HCN by insect pupae.
J. econ. Ent., 1945, **38**: 617, bibl. 3.

l McINTOSH, A. H. 632.951
Relation of crystal size and shape to contact toxicity of D.D.T. suspensions.
Nature, 1946, **158**: 417, bibl. 4.

m MELIN, E., AND WIKÉN, T. 632.952
Antibacterial substances in water extracts of pure forest litter.
Nature, 1946, **157**: 200-1, bibl. 4.

n RAO, R. R., AND VENKATARAMAN, P. R. 631.84: 632.952
Relations between the source of nitrogen and antibiotic formation by *Aspergillus fumigatus*, Fresenius.
Nature, 1946, **158**: 241-2, bibl. 20.

o ROLFF, S. 634.1/7-2.3/8
Svampsjukdomar och skadedjur på fruktträd och bärbuskar. **(Diseases and pests of top and soft fruit in Sweden.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 224-49.

p WELLMAN, R. H., AND MCCALLAN, S. E. A. M. 632.952
Glyoxalidine derivatives as foliage fungicides: laboratory studies.
Abstr. in *Phytopathology*, 1946, **36**: 682.

q WOODSIDE, A. M. 632.653
Life history studies of *Euschistus servus* and *E. tristigmus* [plant bugs].
J. econ. Ent., 1946, **39**: 161-3.

VEGETABLE, RUBBER AND OTHER CROPS.

2011. BULLINGHAM, J. H. 635.1/7
Crops for the small market garden.
Agriculture, 1946, **53**: 268-70.
The author has in view a small market garden fairly near a sizeable town. Potatoes, brussels sprouts, savoys and winter cabbage should be left to the large grower, but it is profitable to concentrate on early salad crops with cloches, early carrots and beetroot, runner beans, peas, leeks and spring cabbage. In planning his rotation the small grower must take into account the vegetable sowings of amateurs who suffer from a burst of enthusiasm in May when the sun shines.

2012. HOBBIS, E. W. 635.1/7
Concluding report on the cropping of 10-rod war-time allotments at Long Ashton and in the city of Bristol.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 104-10, bibl. 2.
Observations on these 10-rod plots show that under the system of rotational cropping adopted it was possible to get annual yields of 1,100 to 1,900 lb. of miscellaneous vegetables from such plots. Composting of vegetable refuse was shown to be advantageous and on such a plot enough material could be accumulated in one year to dress lightly one-third of the plot. The absence of any major disease is attributed at least in part to the planned rotational cropping.

2013. LE ROUX, J. C. 635.1/7: 631.67
Contour planting of vegetables.
Fmg S. Afr., 1946, **21**: 367-8.
The object of this article is to describe a practical method of establishing the position of, and drawing, the planting furrow for crops to be grown under irrigation. A diagrammatic representation of the contour layout is provided.

2014. KJUZ, P. O. (Editor). 635.1/7: 551.566.3
Problems of the cultivation of vegetables in the far north. [Russian.]
Trans. Inst. Polar Agric., Ser. Agron., **2**, 107 pp. The Chief administration of the northern sea route editors, Leningrad and Moscow, 1941. [Received Aug. 1946.]
These transactions consist of articles by various writers on the factors relating to vegetable production in the far north of Russia with particular reference to the neighbourhood of Yeniseish in Siberia. The climate is discussed at some length, the points emphasized being the long winter nights and long summer days, relatively low temperatures of air and soil during the growing season, insufficient available soil moisture during the first half of the growth period with a superfluity during the second half, relatively high atmospheric moisture, strong south winds in winter, and north winds in summer. The diseases and pests of the vegetables grown in that region are described at some length and one article of 18 pages by P. N. Galahov, is devoted to the bio-ecology and control of the cabbage fly (*Hylemyia floralis* Fall). Another article, by V. L. Vasiljev, is an account of vegetable trials in the open in the eastern parts of north European Russia.

2015. DIVISION OF HORTICULTURE, PRETORIA. 635.1/7: 631.531
Certified vegetable seed.
Fmg S. Afr., 1946, **21**: 443, 449.
The merits of South African-grown, Government-certified vegetable seed are set out and the working of the scheme is explained. With the exception of Cape Spitz Cabbage, home-grown cabbage seed is not yet available in the Union.

2016. FOSTER, A. A. 635.1/7: 631.531.17
Stimulation and retardation of germination of some vegetable seeds resulting from treatment with protective fungicides.
Abstr. in *Phytopathology*, 1946, **36**: 680.
Copper fungicides injured cabbage, cucumber, and pea seed, and stimulated beet, eggplant, pepper, and spinach seed germinated in petri dishes or steamed soil.

2017. HEUBERGER, J. W., AND MANNS, T. F. 632.952: 635.1/7
Apparatus and small scale field plot design for evaluating fungicides on vegetables.
Abstr. in *Phytopathology*, 1946, **36**: 686.
The apparatus and plot design described permit application per hour of 12 to 16 treatments on potatoes and 8 to 10 on tomatoes.

2018. TIMOFEEV, N. N. 631.531.13: 581.44
Inheritance of characters in vegetables in relation to the origin of seeds from different stems. [Russian.]
Proc. Sci. Conf. Timirjazev Agric. Acad., 4-11 June, 1945, 1946, pp. 64-8.
Experiments with seeds of carrot, turnip, rape, radish, lettuce, spinach and other crops indicated that seed quality bears some relation to the order and situation of the stems from which the seeds are harvested. In general, the seeds obtained from the main stem and primary stems were heavier than those originating from subsidiary stems. Thus, in rape the weight of 1,000 seeds from the main stem was 0·9-1·1 g. while the weight of the same number of seeds from the primary and secondary stems was 0·6-0·9 and 0·4-0·7 g. respectively. In addition the seeds obtained from stems in the upper portion of a plant were heavier and contained more fat than those originating from stems of the same order in the lower portion. For example, in rape, seeds from the primary stems of the upper portion contained 31·1% fat and those obtained from identical stems in the lower portion of the plant contained 29·6%. Further experiments, mainly with lettuce and radishes, showed that although plants grown from seeds originating from different

stems had a dissimilar rate of growth and development, such individual differences were not hereditary but were due to modifications conditioned by nutritional factors. This was clearly demonstrated by experiments with seeds obtained from hybrids between late and early varieties of lettuce and radish, the expected segregation ratios in respect of colour and length of vegetative period being given by the hybrids.

2019. MOORE, W. C. 632.3/4: 631.531
Seed-borne diseases.
Ann. appl. Biol., 1946, **33**: 228-31, bibl. 6.
This article outlines the procedure at the Ministry's Pathological Laboratory in examining seeds for certification for freedom from injurious plant diseases and dangerous insect pests. Between 1925 and 1943 nearly 30,000 seed samples were examined; of these about 2% were rejected as carrying parasitic organisms. Most of the samples rejected consisted of peas, celery and parsley; other rejections comprised dwarf bean seed affected with halo blight (*Pseudomonas phaseolicola*) or anthracnose (*Colletotrichum lindemuthianum*), sunflower seeds mixed with or carrying the sclerotia of *Sclerotinia sclerotiorum*, and beet seeds bearing rust spores (*Uromyces betae*) or pycnidia of *Phoma betae*.

2020. DYLIS, N. V. 583.4
Contributions to the geography of sphagnum mosses of Komi Autonomous Soviet Socialist Republic. [Russian.]
J. Bot. U.R.S.S., 1946, **31**: 27-38.
Twenty-four species of sphagnum found in the Republic are described. The description includes the environment in which each is found, and other information of interest to ecologists. The practical utilization of the moss is not dealt with.

2021. MILES, H. W., AND MILES, M. 632.651.3: 635.1/7
Eelworm pests and commercial vegetable production.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 157-65, bibl. 38.
In this well documented survey of the eelworm problem which faces market gardeners in this country the authors discuss first the different species which attack different vegetable crops, next the conditions leading to infestation and then appropriate measures to ensure a practical solution. The main species with which English vegetable growers have to contend are: potato root eelworm (*Heterodera rostochiensis*), pea eelworm (*H. göttingiana*), beet eelworm (*H. schachtii*), root-knot eelworm (*H. marioni*) mainly in glasshouses, and stem and bulb eelworm (*Anguillulina dipsaci*). A pernicious feature is their ability to exist for long periods in an encysted state in the absence of their host plants. Their presence is generally associated with characteristic signs of crop sickness such as yellowing and stunting and meagre yield. Broadly speaking, at present there are two ways in which a partial solution is achieved. Either soil fertility is maintained at a high level so that, despite the presence of eelworm, crops are good, or rotations are observed in which long intervals elapse between the planting of suitable host plants. In times of maximum food production the second practice is hard to carry out, but the previous alternative of merely feeding the crop so as to ensure a good return has the disastrous result of making more food available to the eelworms, so that they increase rapidly and become an even greater menace. A third line of action, namely soil disinfection, has its own obvious disadvantages. There is much to be said in badly infested market garden areas for introducing a comprehensive system of restorative husbandry with livestock or poultry and leys as the chief agents of recuperation. Where the retention of intensive systems of husbandry seems essential, it is suggested that short-term crops of soft fruit might be introduced and that such crops as asparagus and rhubarb, and flowers such as paeonies and pyrethrum might also widen rotations. The heavy manuring necessary for such crops would ensure some measure of restored fertility.

2022. LEEFMANS, S. 635.1/7-2.78
Epidemisch optreden van twee rupsensoorten, in het bijzonder in de Wieringermeer, maar ook elders. **(An epidemic of two species of caterpillar, particularly in Wieringermeer, but also elsewhere.)**
Meded. Direct. Tuinb., 1946, pp. 516-20.
Describes epidemic outbreaks in July of caterpillars of the diamond-back moth, *Plutella maculipennis* Curt. and of the gamma moth, *Plusia* (*Phytometra*) *gamma*. The former is confined to cruciferous plants, particularly cabbage, while the latter is polyphagous. The damage they caused is described and illustrated, beet, broad beans, opium poppy, peas and clover being very severely attacked by the gamma moth larvae. Methods of control are discussed.

2023. AHLBERG, O. 632.78
Gammaflyet. ***(Phytometra (Plusia) gamma.)***
Växtskyddsnotiser, 1946, Nr. 3, pp. 33-6.
The biology under Swedish conditions of *Phytometra* (*Plusia*) *gamma*, a pest of various food plants, is discussed. So far, no serious damage by this moth has been reported in Sweden, since the tops of beets and cabbages usually recover after an attack. More harm is caused to flax seed, for instance, where flowers and leaves may be eaten up completely. DDT and Gammexane are among the insecticides recommended, dusting to be done at the rate of 10-15 kg. per hectare.

2024. ANON. 632.76: 633.491
Colorado beetle in England in 1945.
Agriculture, 1946, **53**: 129-33.
Deals with outbreaks in various areas in Kent, at Worthing in Sussex, and at Minsterworth, Glos.

2025. GRIGSBY, B. H. 632.954: 577.17
Some effects of 2,4-D on ragweed and certain woody plants.
Quart. Bull. Mich. agric. Exp. Stat., 1946, **28**: 304-10, bibl. 2.
In continuation of his studies (see *ibid.*, 1945, 28: 45-8; *H.A.*, 15: 1701) the author found that pollen production in ragweed can be prevented by spraying plants in the stage just preceding flower stalk elongation with 250 p.p.m. 2,4-D; as a result very few seeds are produced. At double this concentration pollen production by old plants is stopped, and at 1,000 p.p.m. the plant is killed by a single application. The use of 2,4-D is also tentatively recommended as a cheap herbicide against poison ivy, although eradication of ivy by this method has not yet been demonstrated.

2026. COX, G. M., AND COCHRAN, W. G. 631.544: 519
Designs of greenhouse experiments for statistical analysis.
Soil Sci., 1946, **62**: 87-98, bibl. 13.
For accurate experimentation under greenhouse conditions,* a knowledge of the environmental variations due to the structure and location of the greenhouse and of the variability of the plant material is of prime importance. Brief descriptions are given, with illustrations from greenhouse experiments, of a number of experimental designs that enable the experimenter to utilize this knowledge so as to eliminate the major sources of variation from the experimental errors. An investigation is made of the accuracy of experiments with a given number of replicates. This study shows that under typical greenhouse conditions only large treatment differences can be detected with three or four replicates and makes evident the value of any reduction in standard error per pot obtainable from improved techniques or designs. [Authors' summary.]

* See also 1761.

2027. COPLEY, G. H. 631.544: 631.588.1
A soil-warming experiment.
Gdnrs' Chron., 1946, **119**: 269-70.
This soil-warming experiment was carried out at Potternewton Park, Leeds, with electric cables laid 6 in. below the surface, the alternating current being reduced to 30 volts. The warm soil was covered with cloches, as was a similar area of unheated soil. Excellent results regarding earliness and quality are reported for lettuce, radishes, chicory and mustard and cress. The lettuces on the heated plot, for instance, were cut on 24 April, while the heads on the control strip were not ready by 24 May. In trials with flowers soil heating proved to be of no advantage, possibly owing to the cultivation methods applied.

2028. FAULKNER, R. P. 631.544: 631.588.1
An experiment in soil warming.
Gdnrs' Chron., 1946, **119**: 303-4.
The beneficial effect of electric soil warming in conjunction with cloches is demonstrated by a photograph showing onion and cos lettuce plants sown in early February on heated soil in comparison with plants grown under cloches only. After transplanting, tomatoes were sown on the same site. These developed into sturdy plants of the type generally obtained from an early April sowing in a heated glasshouse. The system installed consisted of bare wire and an all-weather transformer. Current consumption amounted to 1·2 units per day [area not stated].

2029. ENKART, V. 631.544
Serre-couche en réduction. **(A forcing frame in miniature.)**
Courr. hort., 1946, **8**: 54-5.
An amateur, lacking coal, describes how he heats his seed bed electrically, with little expense and trouble. A description is given of a box 75×65×35 cm. with the top removed and a partition of laths fixed horizontally across the middle. The lower compartment is made to receive an ordinary electric lamp and a dish of water. The pots or seed-pans are placed in the upper compartment and the whole covered with a sheet of glass to maintain moisture.

2030. W., J. 631.544.1
Cloche gardening.
Gdnrs' Chron., 1946, **120**: 92.
A visit to the trial grounds of the Chase Cloche Guild on an open day for members is described. In the author's view the successful cultivation under cloches of melons and frame varieties of cucumbers offered the greatest interest. Melon seeds were sown in heat in late February, and the seedlings were planted out at the end of May, the crop being ready in 14 weeks. No hand pollination is required.

2031. STEWART, G. W. 631.544: 635.1/7
A cloche-cropping trial.
Gdnrs' Chron., 1946, **119**: 296.
A cropping trial was laid down at the Edinburgh and East of Scotland Agricultural College Garden, Liberton, in the spring of 1944 and continued throughout 1945, in order to demonstrate the suitability of growing early vegetable and salad crops under the low-barn continuous cloche. A dwarf variety of pea was sown in the centre of each row of cloches and two rows of lettuce were planted on either side. The peas were ready to harvest towards the end of May. Carrots were also sown in combination with peas and lettuce, and profitable results were obtained in all cases. Further, tomatoes and cucumbers were grown successfully under cloches; especially the tomato variety Hundredfold seems ideal for the purposes. Monetary returns from an eighth of an acre for vegetables and salads were £74 and £94 7s. in 1944 and 1945 respectively.

2032. AHLBERG, O. 632.944
En föga beaktad orsak till cyanväteskador på växter. **(A little-noticed cause of cyanide injury to plants.)**
Växtskyddsnotiser, 1946, No. 1, pp. 12.
It is well known that tanks in a greenhouse must be emptied prior to HCN fumigation in view of the absorption of the gas by the water. Sometimes, however, the reservoirs of plants, which store water in their leaves, are forgotten and HCN injury occurs, particularly in the case of *Billbergia*, *Aechmea* and other *Bromeliaceae*. The damage consists of the rotting of the youngest leaf and often of older leaves as far up as the tubes are filled with water. It is necessary to empty these reservoirs some time before the fumigation is carried out.

2033. HENNING, L. J. 633.491-1.532.2
The seed-potato industry of the Union.
Fmg S. Afr., 1946, **21**: 215-6.
During the war the Government encouraged the formation of seed-potato growers' associations in suitable areas of the Union in order to make the best use of the seed imported from Britain. The number of such associations increased from 3 in 1943 to 41 in 1946, producing 60,000 bags of certified tubers under Departmental supervision. The industry has now assumed a permanent character.

2034. POLLARD, A., AND OTHERS. 633.491
Factors affecting quality in potatoes II.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 20-1, bibl. 1.
The main conclusion of the 1944 trials (*ibidem for 1944*, pp. 184-99; *H.A.*, 15: 1706) was confirmed, namely that potato cooking quality is largely determined by characteristics inherent in the site of cultivation. Where quality was initially poor only limited improvement was produced by manuring. Seasonal effects were also noticeable. Subject to the limits imposed by site the correction of definite deficiencies gave some improvement in general quality. The effects of different treatments are discussed.

2035. CRANG, A., JAMES, D., AND STURDY, M. 633.491
The control of blackening of boiled potatoes.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 221-6.
Results of trials show that blackening can be lessened by the addition of 1 tablespoon of vinegar to each quart of cooking water or almost completely eliminated by adding ½ g. sodium metabisulphite (=1 Campden preserving tablet)+1 tablespoon of vinegar per quart of water. In the latter case the cooked potatoes will contain some 35 p.p.m. of SO_2. In addition some loss of flavour and flouriness occurs.

2036. MONTALDO BUSTOS, A. 633.491
Determinacion de la calidad culinaria de las papas mediante su peso especifico. **(Estimating the culinary quality of potatoes by their specific gravity.)**
Agric. tec. Chile, 1944, **4**: 78-87, bibl. 13.
The author finds that the determination of the specific gravity (by salt solutions) of potatoes is a rapid and effective method of ascertaining the culinary quality of the tubers.

2037. WALLACE, T., AND CATLOW, E. 633.491-1.8
Manurial experiments on vegetable crops. IX. Effects of farmyard manure and of various fertiliser treatments on three varieties of potato.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 95-102, bibl. 1.
Majestic, Kerr's Pink and Red King were the potato varieties used in these fertilizer trials. Dung alone resulted in low N status, and NPK and PK were associated with Mg deficiency symptoms. Low N and low K were the most serious limiting factors for tuber production. Tuber yields from dung were similar to those from NPK. Although in NPK treatments foliage injury resulted from the use of chloride, yields were comparable to those from sulphate. Red King was much more susceptible to unfavourable conditions than the others. Comparison of results with

those of previous trials on these vegetable rotation crops showed that low N and low P status were particularly important in reducing yields of brassicas, while low K was unimportant for them but more important for carrots, onions, beet and potatoes. Slight blackening occurred on cooking tubers from the no potash plots.

2038. NICHOLAS, D. J. D. 633.491-2.19
The application of rapid chemical tests in the diagnosis of mineral deficiencies in potato plants.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 60-80, bibl. 15.

Tissue test standards for K, Mg, Ca, PO_4, NO_3, Cl and Mn were found to be applicable to potatoes growing under various manurial treatments at four centres differing widely in soil characters. In most instances the values reflected the manurial treatment and were a useful guide to fertilizer requirements. Tissue test values were in accord with the full chemical analysis at the three sampling dates. The technique is valuable as an early diagnostic method for potatoes growing on widely different soils. [From author's summary.]

2039. HOLMBERG, C. 633.491
Drivbänksförsök med tidiga kräftimmuna potatissorter. **(Variety trials with early canker-immune potatoes grown in hotbeds.)**
Växtskyddsnotiser, 1946, No. 3, pp. 40-2.

The results of a 5-year trial are tabulated, Early Puritan serving as the standard variety. The figures given refer to yields of 20 plants of each variety grown under one hotbed light.

2040. ANDRÉN, F. 631.531.17: 633.52
Betningsförsök med lin-och hampfrö. **(Linseed and hemp seed sterilization.)**
Växtskyddsnotiser, 1946, No. 1, pp. 10-12.

Seed sterilization of linseed and hemp with a number of chemicals gave an increase in stand of 14-18%. The results are tabulated. The dosage recommended for dusts is 400 g. per 100 kg. seed and for solutions 400 c.c. per 100 kg.

2041. AFANASJEV, A. 633.52
The recovery and subsequent increase in Soviet flax production. [Russian.]
Soc. Seljsk. Hoz. (Socialist Agriculture), 1945, No. 10, pp. 33-7.

The article is not concerned with the technique of flax cultivation, but with a criticism of policy and organization of flax-growing throughout the country as a whole, with the suitability of regions for raising the crop, with wastage during processing, and with marketing.

2042. MILLINGTON, A. J. 633.52
Wada, a rust-resistant flax variety.
J. Aust. Inst. agric. Sci., 1946, **12**: 50-1.

Flax rust is very important in Western Australia, since it readily oversummers on infected straw and is present every season, although the severity of attack varies from year to year. A number of linseed varieties are resistant to the known Australian rust races and by back-crossing several institutions are endeavouring to incorporate this character in a flax variety. Direct selection has yielded a variety which, it is hoped, will be available for commercial increase during 1946. Bulked material has been tested and will probably be released as the variety Wada. It is very similar in maturity, growth, and appearance to Liral and Riga Crown, but it grows rather taller; its seed yield is rather low.

2043. CROOK, E. M. 633.71: 581.192
The extraction of nitrogenous materials from green leaves.
Biochem. J., 1946, **40**: 197-209, bibl. 28.

A process for extracting 90-95% of the nitrogenous material from tobacco leaves is described. The steps in this process are: preliminary mincing and washing, grinding in a triple-roller ointment mill, extraction with dilute sodium hydroxide at pH 8·0, repetition of grinding and extraction. [From author's summary.]—Rothamsted Experiment Statio.

2044. BEARD, F. H., AND WILSON, D. J. 633.79-1.535
Propagation trials with hops. II. Preliminary trials in propagation by soft-wood cuttings.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 96-103, bibl. 3.

In continuation of the work on propagation of hops at the East Malling Research Station (see *H.A.*, 14: 1709), the present paper describes preliminary trials on propagation by soft wood cuttings, using basal and lateral cuttings of Fuggle and four *Verticillium* wilt-resistant varieties. Basal Fuggle cuttings made from long (mature) shoots from earthed hills and having initial rooting produced the highest number of plants; lateral cuttings of Fuggle were a complete failure. Treatment with β-indolylbutyric acid was harmful. The four wilt-resistant varieties can be propagated from basal cuttings; cuttings with some initial rooting gave the best results, and those from the middle portion of laterals gave much better results than those with a heel.

2045. BEARD, F. H. 633.79-1.535
Propagation trials with hops. III. A comparison of the performance of cuttings made from runners, layers and "straps".
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 104-6.

A further contribution to the investigation on propagating hops (see preceding abstract). Runner cuttings yielded as many good sets, though smaller, as strap-cuts. Layer cuttings gave, in some cases, fewer good sets than strap-cuts, but this was offset by the large number of cuttings produced from the parent plant by layering. Layer cuttings produced smaller sets than strap-cuts. It is suggested that there is no advantage in producing very large sets and that those from runner and layer cuttings are large enough.

2046. BEARD, F. H. 633.79-2.4
Observations on the incidence of mould *(Sphaerotheca Humuli)* on the new seedling hops at East Malling in 1945.
A.R. East Malling Res. Stat. for 1945, **A29**, 1946, pp. 107-14, bibl. 7.

A serious outbreak of mould (powdery mildew) on new seedling varieties of hops at East Malling in 1945 is described; some were attacked in the burr stage and bore no crop and others were severely attacked on the cones. Some were free from the disease. There was a high degree of infection in certain parental groups, particularly the first generations from the wild New Mexican hop and the wild hop from Manitoba, forms of *Humulus americanus*. Other parentage groups, such as third generation from the New Mexican hop, second and third generations from the wild hop, Manitoba, and third generation from the Oregon Cluster had a number of mould-free seedlings. Among the larger plantings of the named new varieties none was free from disease, though some were only slightly attacked. Three were severely attacked, and one, Quality Hop, had its crop almost entirely destroyed. There appeared to be a tendency for heavy cropping to be associated with high incidence of and light cropping with resistance to mould.

2047. DIJKSTRA, S. P. 633.822
Onderzoek naar het gehalte en de samenstelling van pepermuntolie verkregen uit enkele typen van *Mentha piperita* L. **(The content and composition of peppermint oil obtained from certain types of *Mentha piperita*.)**
Meded. Proefbedr. geneeskr. arom. aanverw. Gewas. Buitenpost Nos. 4 and 6. Reprinted from *Meded. Inspect. Tuinb. Tuinbouwonderw.*, 1944, Nos. 13-16, pp. 207-8.

Three types of peppermint were grown at the Buitenpos

trial garden in 1942, viz. the black, green, and Mitcham types. The Mitcham type was found to be impure, and otherwise unsuitable for the preparation of the essential oil, oleum menthae piperitae. The green and black types yielded oil conforming to the requirements of the Netherlands Pharmacopoeia. The green types yielded more and finer oil than the black type.

2048. LANTZ, E. M. 633.842: 577.16
Some factors affecting the ascorbic acid content of chile.
Bull. N. Mex. agric. Exp. Stat. **324**, 1945, pp. 14, bibl. 13.

Data on the ascorbic acid values of two varieties of chile have been reported. College No. 9 chile was found to be richer in ascorbic acid than Anaheim chile when the two varieties were grown under the same conditions. In general, peppers gathered in the early afternoon were higher in ascorbic acid than those gathered earlier in the day, especially when the values were expressed on the fresh basis. Low values were found on cloudy days. Green peppers gathered in late September and in October were richer in ascorbic acid than those picked earlier in the season, whether the results were expressed on the fresh or on the moisture-free basis. Extremely high ascorbic acid values were found in ripe peppers. However, the fully ripe peppers contained much less moisture than the green ones, and the highest values on a dry-weight basis were found in green or partially ripe peppers [3,434 mg. per 100 g.]. Some data on the rate of loss of ascorbic acid from ripe peppers held at room temperatures are reported. [Author's summary.]

2049. IRANI, R. J. 633.85: 581.192
Chemistry of kurchi seeds. Parts I-IV.
Curr. Sci. 1946, **15**: 106-7, 161, 191-2, 229-30.

An investigation of the chemistry of kurchi seed oil (*Holarrhena antidysenterica*). Part I deals with the isolation of a crystalline glyco-alkaloid. Part II with the isolation of the bromide of a linoleo-dilinolenin from the fatty oil. Part III with a new and simple method of analysis of bromoglycerides. Part IV with the isolation of galactose from the picric acid hydrolysis of the glyco alkaloid.

2050. ŠREIBER, L. L. 633.853.55
The castor oil plant. [Russian.]
Lenin Acad. agric. Sci. State Inst. Pl. Ind., Leningrad, 1937, 80 pp., bibl. 42. [Received Aug. 1946.]

In U.S.S.R. the castor oil plant goes farther north than in neighbouring countries. It can be grown without irrigation in some regions, but in others irrigation is essential for good yields. The extension of its cultivation still farther north and east is closely bound up with the introduction and cultivation of new early-ripening varieties of good yield and tolerant of dry conditions. The paper consists mainly of accounts of results of trials in the various castor oil plant growing provinces of U.S.S.R. Five varieties of promise are described and the regions for which they are suitable are mentioned for each.

2051. STEVENSON, E. C. 633.853.55: 631.531.17
Seed treatment of castor beans for the control of seedling blight.
Abstr. in *Phytopathology*, 1946, **36**: 689.

Seedling diseases of castor beans cause blight or die back. Seed treatment for the control of these diseases has been carried out using various proprietary preparations, resulting in some cases in significantly better emergence.

2052. GUILLAUME, A. 632.951: 638.12
Le traitement des champs de colza par les nouveaux insecticides, et les abeilles. **(Insecticide treatment of colza and the effect on bees.)**
C.R. Acad. Agric. France, 1946, **32**: 483-4.

Good results with D.D.T. sprays against insect pests of colza are recorded, but in some cases bees were poisoned. It was found that some of the colza plots had been sprayed in bloom, hence the damage to the bees. The warning is given, therefore, not to spray colza when in flower.

2053. ANON. 633.854.78
Girasol para 1946. **(The sunflower for 1946.)**
Rev. mens. B.A.P., 1946, **29**: 49-53.

Describes an improved selection of sunflower in the possession of the Buenos Aires & Pacific Railway Co. Its superior qualities in comparison with the strain commonly grown are: uniform height; uniform time of ripening, thus facilitating the harvest; precocity, guaranteeing good yield even in dry years; uniform colour of the grains, and so higher market quality.

2054. HATT, H. H. 633.85
The seed oil of the saffron thistle (*Carthamus lanatus* L.).
J. Coun. sci. industr. Res. Aust., 1946, **19**: 86-95, bibl. 25.

The saffron thistle was found to yield a useful drying seed oil very similar to that of the safflower. However, since the oil yielded seems to have no advantage over the oil of safflower, varieties of which with a high seed oil content are grown in Australia, there appears to be no point in cultivating saffron thistle. The properties of the oil and its extraction are discussed in detail.

2055. HILLS, K. L. 633.859
The suitability of a number of varieties of opium poppy for the production of morphine from the ripe capsule.
J. Coun. sci. industr. Res. Aust., 1946, **19**: 177-86, bibl. 5.

Out of 44 varieties of opium poppy compared in plot trials in New South Wales, Victoria and Western Australia, six were chosen for further investigation. Since unfortunately none of these varieties possesses more than a few of the characteristics desired, such as earliness, high morphine yield, frost resistance, shortness of straw and indehiscence of the capsules, a breeding programme has had to be undertaken to combine the valuable properties in one variety. Initial results are reported as promising. High morphine concentration in the husks under Australian conditions does not appear to be related to geographical origin or botanical classification.

2056. HILLS, K. L. 633.859
Changes in the morphine and dry matter content of the opium poppy *(Papaver somniferum)* during the maturation period.
J. Coun. sci. industr. Res. Aust., 1945, **18**: 286-97, bibl. 9.

It was desirable to determine the distribution of morphine in the poppy plant at various stages from petal fall to capsule maturity in order to find the most suitable harvesting dates and methods for morphine production from dry poppy hay. It was found that under Australian Capital Territory conditions morphine content in the husks is highest just after the 14th day after petal fall and that it does not vary substantially until the 35th day. The drug is concentrated in the upper half of the stem. On the basis of the data presented, which include those on seasonal variations of dry matter content, it is recommended that "the capsules and upper portions of the stems only should be harvested, and that generally the cutter bar of the header should be set sufficiently low to include most of the capsules, but not higher than three-quarters of the average height of the stems. The crop should be harvested as soon as the capsules are dry enough to bag directly from the header".

2057. BARNARD, C., AND FINNEMORE, H. 633.88
Drug plant investigations. 1. Progress report.
J. Coun. sci. industr. Res. Aust., 1945, **18**: 277-85, bibl. 5.

The investigation was undertaken to determine whether certain essential drugs of plant origin could be produced

successfully in Australia. Plants yielding the following drugs were studied in plot trials: morphine, hyoscine, atropine, hyoscyamine, ephedrine, digitalis and santonin. Leaf samples of the native tree species *Duboisia myoporoides* and *D. leichhardtii* were examined as sources of hyoscyamine, atropine and hyoscine.

2058. KALAŠNIKOV, V. P. 633.88
Botany and pharmacology. [Russian.]
Priroda (Nature), 1945, No. 6, pp. 35-40.

A. P. Orehov and his colleagues examined 900 plants in the U.S.S.R. and found that 152 of them contained alkaloids, of which 65 were extracted and have for the first time been described. Among them are anabasin, salsolin, platyphyllin, sphaerophysin and cytisin. The names of many plants, containing alkaloids, glucosides, and other substances, and used for medicinal and other purposes, are given in the article. Successful attempts are being made to grow tropical and semi-tropical plants in the U.S.S.R. Cinchona trees are utilized when they are 2 years old; several thousand cocaine-bearing bushes and also camphor trees are being grown. The latter can be utilized not only as whole trees, but the twigs and leaves of both old and young trees can also yield camphor. The search for useful wild plants still goes on in the U.S.S.R. From the Altaï region comes *Coluria geoides* (*Rosaceae*) which contains an oil similar to clove oil. *Thermopsis lanceolata* (*Leguminosae*) yields a substitute for ipecacuanha. *Polygala tenuifolia* can replace the imported *P. senega*. *Periploca graeca* contains the glucoside, periplocin, which will enable the imported strophantin to be dispensed with. Certain species of *Artemisia* have been found in the U.S.S.R. which contain dextrorotary camphor. *Ocimum canum* is being grown in the Ukraine and also contains this camphor. Species of *Rheum*, of which the roots and not the rhizomes are used, may replace the imported species. Lobelin from the home-grown *Lobelia inflata* is found to be superior to the synthetic product.

2059. MUKERJI, B. 633.88
Antimalarial drugs of the indigenous materia medica of China and India.
Nature, 1946, **158**: 170, bibl. 4.

Preparations from *Fraxinus malacophylla*, *Alstonia scholaris* and *Caesalpinia bonducella* were studied. The drugs had a febrifugal but not an antimalarial action.—Biochemical Standardization Laboratory, Calcutta.

2060. KING, H. 632.951
Botanical origin of tube-curare.
Nature, 1946, **158**: 515-6, bibl. 4.

The drug *dextro*-tubocurarine chloride, used in anaesthesia, is derived from the plant *Chondrodendron tomentosum*. A specimen of this species, collected in Peru, yielded however *laevo*-tubocurarine chloride, which had a comparatively very weak curare action. The conclusion is drawn that there are two hitherto undifferentiated species under the name of *C. tomentosum*.—National Institute for Medical Research, Hampstead, London.

2061. DEMIDENKO, T. T. 633.88-1.8
Accumulation of nutrient elements by perilla in the course of growth.
C.R. Acad. Sci. U.R.S.S., 1946, **51**: 233-5.

The root system of perilla [? *Perilla nankinensis*] develops rapidly downwards and particularly laterally so that at the time of maturity the roots of neighbouring plant rows may interweave. In order to obtain a yield of vegetation of 40·8 centners and a yield of seed of 3·6 centners per hectare the following amounts of nutrient substances (kg. per hectare) have been found to be necessary: N, 61·4; P_2O_5, 23·5; K_2O, 94·6; CaO, 70·8; MgO, 26·5. Nitrogen and potassium are taken up with greater intensity during the initial periods of growth, phosphoric acid fairly regularly throughout the whole period of growth.

2062. DIJKSTRA, S. P. 633.88
Invloed van de bemesting op het gehalte en de opbrengst aan folia stramonii van *Datura stramonium inermis*. **(The effect of manuring on the content and yield of folia stramonii from thorn-apple.)**
Meded. Proefbedr. geneeskr. arom. aanverw. Gewas. Buitenpost, No. 2, ? 1943, pp. 355-7.

An experiment was carried out with 27 combinations o NPK fertilizers. The general conclusion was that manurin had no effect on alkaloid content, but that nitrogen had favourable effect on the total crop of leaves.

2063. MULDER, A. 633.88
De helleboruscultuur en haar moeilijkheden in Aalsmeer. **(The difficulties in cultivating the black hellebore.)**
Tuinbouw, 1946, No. 2, pp. 11-6.

An account of the Christmas rose, *Helleborus niger* L., and its cultivation. The structure of the flower is briefly described and this is followed by an outline of the history and mythology of the plant. Two varieties, Buis and Keessen, are described. The plants are propagated by dividing, and planted out in spring or late summer. Those planted in spring are more subject to damage from unfavourable environmental conditions, pests (particularly the leather-jacket) and diseases, than those planted in August or September. *Coniothyrium hellebori* causes considerable damage to the foliage in spring. The plants are set out in 5 rows 25 or 30 cm. apart, and shade shrubs (elm, poplar or the flowering cherry *Prunus serrulata*) are often grown between the first and second rows of each bed.

2064. DIJKSTRA, S. P. 633.88: 581.192
Onderzoek naar het gehalte van folia belladonnae, verzameld van eenige typen van *Atropa belladonna*. **(The alkaloid content of folia belladonnae obtained from a number of types of deadly nightshade.)**
Meded. Proefbedr. geneeskr. arom. aanverw. Gewas. Buitenpost, No. 1, 1943 and No. 5, 1944, 2+1 pp.

Six types of *Atropa belladonna* were examined for their alkaloid [atropine] content; the greatest amount was yielded by var. *lutea*, yellow with a purple corolla edge a pure yellow strain had a high alkaloid content also.

2065. ANDERSSON, G. 633.913(485)
Möjligheterna för en svensk produktion av naturgummi. **(The possibilities of natural rubber production in Sweden.)** [English summary 1½pp.]
K. LantbrAkad. Tidskr. Stockh., 1946, **85**: 269-82.

In this lecture, given at a meeting of the Royal Academy fo Agriculture, Stockholm, in April 1946, the prospects o kok saghyz rubber production in Sweden are described a promising. At the moment, the industry is in its firs experimental stage, fostered by the Government Industria Commission, experiments and breeding work being carrie out by the Swedish Seed Association at Svalöf. Averag yields in 1944 amounted to 2,280 kg. roots per hectare wit a rubber content of 1·9% or 43 kg. per hectare, whi plantations in Halland under favourable conditions yielde 4,020 kg. roots or 109 kg. rubber per hectare. It appea that the damp climate of West Sweden is best suited rubber production and the drier climate of East Sweden seed production. Sowing in May in rows 25 cm. apart an letting the plants grow without thinning has so far given th best results. The future of the crop in Sweden rests on th selection of high-yielding strains and on the developmen of suitable machinery.

2066. SOLOVEJ, F. M., AND GORBATOV, P. P. 633.913
Mechanized cultivation of kok saghyz. [Russian.]
Ogiz-Seljhozgiz, 1944, 64 pp.

This brochure is an account of the implements used

arious stages in the cultivation of kok saghyz, from the reparation of the ground before sowing to the harvesting f the seed and the roots. It is illustrated by 39 drawings, ome of them elaborate, thus Fig. 14, as a folder, shows etails, in plan and elevation, of a horse-drawn earthing-up ultivator for use between the rows.

067. GORHAM, P. R., AND LANDES, M. L. 633.913-1.535.7
Investigations on rubber-bearing plants: I. Propagation of *Taraxacum kok-saghyz* by means of leaf cuttings.
Bot. Gaz., 1945, **107**: 260-7, bibl. 8, being *Contr. Bot. Plant Path., Sci. Serv. Ottawa, Canada* **826.**

'or ordinary practical purposes propagation by leaf cuttings f kok saghyz has nothing to recommend it, but in special ircumstances, such as the establishment of polyploid lones, the method will prove useful. Factors considered ssential in the propagation of leaves are discussed. Failure f growth substances to improve rooting and differences etween clones in their ability to regenerate are noted.

068. MEYER, B. S. 633.913: 546.27
Effects of various concentrations of boron on the development of *Taraxacum kok-saghyz* in sand culture.
Amer. J. Bot., 1946, **33**: 204-9, bibl. 13.

n sand cultures of kok saghyz with various concentrations f boron the maximum root yields were obtained at 10-15 .p.m. of boron, although moderately good development ccurred over a much wider range. Kok saghyz has thus much higher boron requirement and tolerance than most ther species which have been investigated. Foliar symp- oms could be recognized for boron deficiency but not for oron toxicity.

069. DOBRUNOV, L. G. 633.913: 581.192
On age variation in rubber quality in tau saghyz. [Russian.]
C.R. Acad. Sci. U.R.S.S., 1946, **51**: 317-9.

ubber production in tau saghyz increases with the age of ie plant; the highest viscosity indices were found in 5, and 11-year-old plants. The high polymerization of the ubber in old plants depends on the age of the plastids of ie latex vessels rather than on the increase in their numbers.

070. WHITTENBERGER, R. T., AND KELNER, A. 633.913
Rubber in cryptostegia leaf chlorenchyma.
Amer. J. Bot., 1945, **32**: 619-27, bibl. 36.

he wartime loss of hevea rubber suggested other sources of atural rubber. *Cryptostegia grandiflora* and a hybrid ere examined and an unusual type of rubber storage was ound in the leaves. Most of the leaf rubber occurs as on-latex globules in the mesophyll chlorenchyma, entirely stinct from the duct system; these globules are most umerous in the palisade cells of fully mature leaves. The obules contain about 65% of rubber hydrocarbon, the maining 35% consisting largely of acetone-soluble aterial (resins).

071. CURTIS, J. T., AND BLONDEAU, R. 633.913-1.55
Influence of time of day on latex flow from *Cryptostegia grandiflora*.
Amer. J. Bot., 1946, **33**: 264-70.

linimum yields of latex and rubber were obtained in all ises during midday hours. Yields of rubber from the bark old trunks and from young fruits continued low through- ut the afternoon, whereas yield from the whip-like vegeta- ve branches returned in the late afternoon to a point ualling or exceeding that of early morning. From the andpoint of plantation practice, it appeared that only orning tapping should be used for trunk latex collection, ut that whip latex and fruit latex could be collected roughout the day with provision for a relatively long on-time rest period.

2072. CURTIS, J. T., DUNCAN, R. E., AND BLONDEAU, R. 633.913: 581.192
Non-latex rubber in cryptostegia.
Amer. J. Bot., 1946, **33**: 578.

The authors do not believe from observations described that the mere presence of organized globules of rubber in leaf chlorenchyma offers sufficient support for the theory that such globules act as temporary storage centres for rubber which is later digested and translocated in a manner analogous to sugar-starch transformations. The facts that such globules are found in non-chlorophyll-containing cells, and occur in greatest number in old cells, and are absent or rare in young, actively photosynthesizing cells, would indicate that the reactions involved are not correlated with the carbon assimilation mechanism.

2073. ERICKSON, L. C. 633.913
The water factor in transplanting guayule.
Amer. J. Bot., 1945, **32**: 634-43, bibl. 11.

In the machine-planting of guayule [*Parthenium argentatum*] it is the practice to use only about 6 inches of the tap root system, that may be from 4 to 10 feet long. To compensate for this it has been found beneficial to prune the top severely, and the object of the investigation described was to determine whether or not the value of topping in hastening the establishment of the transplants was associated with its effect on the water relations of the plant. It was found that the principal physiological benefit of topping came from reduction of transpiration. Without this reduction, tap roots of leafy transplants with few or no lateral roots almost always became low in moisture content and failed to develop new roots in reasonable time, as contrasted with the best results obtained for certain degrees of topping, under conditions of both water culture and soil. When the relative humidity was high (95 to 100%) little or no defoliation was necessary to obtain rooting of plants in water.

2074. ROLLINS, R. C. 633.913
Interspecific hybridization in parthenium. II. Crosses involving *P. argentatum, P. incanum, P. stramonium, P. tomentosum* and *P. hysterophorus*.
Amer. J. Bot., 1946, **33**: 21-30, bibl. 12.

Crosses between *P. argentatum* and *P. incanum* have been reported previously (see *H.A.*, 16: 278). The present paper is concerned with crosses involving these two species and three others. It is illustrated by 14 photographs.

2075. MARKOVA, L. G. 633.913
An embryological study of guayule and related species. [Russian.]
J. Bot. U.R.S.S., 1946, **31**: 19-26.

The propagation of guayule and much concerning its reproductive organs require further study in order that methods of breeding may be improved. Authorities have disagreed about many features of the reproductive system of *Parthenium* spp.; thus it has not been definitely settled whether guayule is cross or self-pollinated. The present work shows that apomixis and many other abnormalities can be met with in the 7 botanical varieties of *P. argentatum* and in *P. incanum* and *P. hysteropus*, of which the embryo sac was studied at successive stages of its development. Such abnormalities, believed to arise from the hybrid origin of *Parthenium* spp., account for the lack of agreement among investigators concerning the reproductive system in plants of this genus.

2076. BONNER, J. 633.913: 581.192
Further investigation of toxic substances which arise from guayule plants: relation of toxic substances to the growth of guayule in soil.
Bot. Gaz., 1946, **107**: 343-51, bibl. 1.

In an earlier paper (*ibidem*, 1944, 106: 185-98; *H.A.*, 15: 670) the author showed that the roots of guayule plants

growing in gravel culture emanate toxic substances. He failed, however, to detect these growth-inhibiting agents in nursery and field soils, where guayule had been grown for periods of 2-8 years.—California Institute of Technology, Passadena.

2077. Ministry of Agriculture, London. 635.1
Root vegetables.
Bull. Minist. Agric. Lond. **120,** 1946, pp. 21, 9d.
The latest information on the cultivation of root vegetables in England is given. The crops concerned are:—carrots, beetroot, parsnips and turnips. Shorter notes are given on swedes, Jerusalem artichokes, salsify, scorzonera, celeriac and kohl rabi. Pests and diseases are very briefly discussed as in the other bulletins of this series, i.e. 131 and 132, and possible methods of weed control receive their mention and a reference to another source of information on the subject.

2078. Wallace, T., and Catlow, E. 635.11: 631.8
Manurial experiments on vegetable crops. X. Effects of farmyard manure and other manurial treatments on garden beet.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 102-4, bibl. 1.
Highest yields followed the use of complete NPK with hoof and horn as the source of nitrogen, the lowest from straw-sewage sludge and from a complete fertilizer containing inorganic NPK plus magnesium sulphate. Varietal differences in yield were noted. The preceding crop was cauliflower.

2079. Smith, K. M., and Markham, R. 635.12: 632.8
An insect vector of the turnip yellow mosaic virus.
Nature, 1946, **158**: 417, bibl. 1.
Observations and experiments showed fairly conclusively that yellow mosaic of turnip is transmitted by flea beetles, which thus afford the first instance of a biting insect vector in Great Britain.—Plant Virus Research Station and Molteno Institute, Cambridge.

2080. Woodman, R. M., and Johnson, D. A. 635.13: 631.8
The nutrition of the carrot. III. Grown in a gravel soil.
J. agric. Sci., 1946, **36**: 10-7, bibl. 3.
The nutrition of the carrot in a light gravel soil of known analysis with high available phosphate has been studied by statistical pot culture methods. Different parts of the plant (top and root) were shown to be capable of responding quite differently to a particular fertilizer. There was a positive response in yield of fresh roots to dressings of potash, and, simultaneously, a negative one in yield of tops, so that the top/root ratio for fresh matter was large with a deficiency of potash; this finding has been borne out by field trials and by sand cultures of carrots. There was absolutely no response to potash as regards the dry-matter content of the tops, roots, and whole plants; but dressings of potash decreased the moisture content of the tops and increased that of the roots, and the large top/root ratios for fresh matter encountered in the absence of potash were found to be entirely due to moisture content, the ratios being uninfluenced when calculated for dry matter. Applications of nitrogen resulted in increases in the dry matter in the tops and whole plants, but not the roots, and the increase in yield obtained for the fresh roots of the carrots with nitrogen was due to increased water content. The moisture in the tops was decreased in amount by nitrogen applications. Phosphate caused absolutely no response in fresh yields of tops, roots, or whole plants. It did, however, increase dry matter in the tops, though not in the roots, and it decreased the moisture content of the tops and increased that of the roots; the net consequence of these effects was that the top/root ratio for fresh matter was uninfluenced, but that there was an increase in this ratio for dry matter. [From authors' summary.]—Horticultural Research Station, Cam bridge.

2081. Marani, M., Goia, G., and Rossi, L. 635.13: 631.531
Ricerche sul trapianto di radici di carota destinate alla produzione del seme. **(Transplanting carrot roots for seed production.)**
Riv. Fruttic., 1943, **7**: 93-5.
Trials described show that the highest yield of carrot see is obtained from large and medium-sized roots transplante in the autumn. A number (about half that of the numbe planted out) of the smaller ones should be retained fo filling up gaps that may occur during the winter.

2082. (Newton, H. C. F., Satchell, J. E., and Shaw, M. W.) 635.13: 632.77
Carrot fly control.
Gdnrs' Chron., 1946, **120**: 171.
In three years' experiments on carrot fly control on garden and allotment scale with DDT and Gammexan dusts, the latter, especially, gave spectacular results illustrated by photographs. The requisite number applications and minimum dosages have still to be worke out, but it appears unwise to rely on a single dressin against each generation.—Harper Adams Agricultura College, Newport, Salop.

2083. Newton, H. C. F., Satchell, J. E., and Shaw, M. W. 635.13: 632.77
Carrot fly control.
Nature, 1946, **158**: 417.
For an abstract of the authors' work on carrot fly contr see abstract 2082. The present communication contain the additional information that Gammexane has no phyt cidal effect on carrot plants, whereas even moderate dressing of the chemical may seriously injure *Brassica* stems at th point where contact is made.

2084. Holdsworth, M., and Heath, O. V. S. 635.25: 581.43
An apparatus for recording automatically the course of bulb formation, with some preliminary observations on bulb development in the onion.
Ann. Bot. Lond., 1946, **10**: 293-300.
The construction and use of a simple apparatus for recordin the swelling of an onion bulb are described. Some specime records are reproduced in which daily cycles in the rate swelling are shown. The cause of these fluctuations briefly discussed and evidence presented that they are main effect of temperature. The onset of bulbing may detected within two days of the first application of t stimulus of long days. [Authors' summary.]

2085. Peters, J. J. 635.25: 576.312.35
Cytological effects of sulfanilamide on *Allium cepa*.
Bot. Gaz., 1946, **107**: 390-2, bibl. 4.
Soaking of *Allium cepa* bulbs in a 0·5% aqueous solution sulphanilamide for 48 hours was found to induce polyploi in the root tips, though the drug was less effective th colchicine.—Fordham University, N. York.

2086. Cronshey, J. F. H. 632.482: 635.25
The perfect stage of *Botrytis squamosa* Walker.
Nature, 1946, **158**: 379, bibl. 2.
In an agar culture of *Botrytis* conidia from onion lea apothecia were formed. The fungus could be identifi as *B. squamosa*, its characters being consistent with those o *Sclerotinia*.—School of Agriculture, Cambridge.

2087. Chapman, A. J., Fife, L. C., and McGarr, R. L. 635.25: 632.73
DDT for control of the onion thrips.
J. econ. Ent., 1945, **38**: 608-9.
Preliminary tests of DDT dust against onion thrips ga sufficiently encouraging results to warrant further expe ments.

088. DONCASTER, J. P., AND KASSANIS, B. 635.263: 632.753: 632.8
The shallot aphis, *Myzus ascalonicus* Doncaster, and its behaviour as a vector of plant viruses.
Ann. appl. Biol., 1946, **33**: 66-8.
new species of aphis has been found on shallots in storage nd on onions and other plants in greenhouses and in pen. It is briefly described and named *Myzus ascalonicus*, nd compared with *M. persicae*, which it resembles super-cally.

089. THOMPSON, H. C. 635.31
Spacing affects yield of asparagus.
Bull. Cornell agric. Exp. Stat. **822,** 1945, pp. 8, bibl. 1.
n the experiment described the asparagus plants were paced 12, 18 and 24 in. in the row, the distance between ows being 4 and 5 feet. It was shown that on soils of oderate fertility spacing of more than 18 in. cannot be ecommended, while the two distances between rows did ot produce any significant difference in yield. Closer pacing than 18 in. within the row is likely to be beneficial r the first 10 years.

090. LOO, S.-W. 635.31: 578.08.3
Further experiments on the culture of excised asparagus stem tips *in vitro*.
Amer. J. Bot., 1946, **33**: 156-9.
xcised stem tips of asparagus were kept growing *in vitro* r 22 months through 35 successive transfers. Dilute gar medium (5%) was found to be as good, if not better, an liquid medium and in addition provided support for e stem tips.

091. MINISTRY OF AGRICULTURE, LONDON. 635.34+635.36
Cabbages, brussels sprouts and miscellaneous green crops.
Bull. Minist. Agric. Lond. **132,** 1945, pp. 30, 1s.
fter a brief note on cabbage varieties the authors give ecific advice on cultivation from seed to disposal of crop. structions given apply to particular types of cabbage. eparate sections concern (1) brussels sprouts and (2) routing broccoli and kale. Short notes are given on pest nd disease control with references generally to leaflets ving more detailed advice. A calendar is given suggesting ow cabbage or savoy can be made available every month the year by cultivation in Southern England [perish the ought !]. Finally local practice is recorded.

092. BUSHNELL, J. 631.8: 635.3/6
Fertilizers for early cabbage, tomatoes, cucumbers, and sweet corn.
Bull. Ohio agric. Exp. Stat. **662,** 1941, pp. 30, bibl. 7.
he present third report on a fertilizer experiment, which as carried out for 26 years at the Washington County ruck Crops Experiment Farm, Marietta, Ohio, covers e period 1931-38. Summaries of the data collected uring the first 12 and 16 years were published in Bulletins 7 (1924) and 420 (1928) respectively. In view of the low king capacity of the soil for phosphorus, residual phos-horus was ample for the crops. It is thought that in the ourse of time this high P level will be reached by many getable soils, so that the results obtained are of a more neral interest. Soil phosphorus tests of water extracts ould give an indication of the amount of available phos-horus present. The four crops tested were found to vary dely in their capacity for withdrawing phosphorus from e soil. In order to produce maximum yields a higher P vel must be maintained for tomatoes than for cabbage d a higher level for cabbage than for sweet corn; the sults for cucumbers were not conclusive. Table 19 mmarizes the recommendations deduced from the data d gives the following formulae: Cabbage: 8-4-8, 1,500 lb. per acre; tomatoes: 5-6-12, 1,000 lb. per acre; sweet corn: 5-0-8, 1,000 lb. per acre. With 8 tons of manure per acre the formulae are modified as follows: Cabbage: 8-4-0, 1,000 lb. per acre; tomatoes, 0-20-0, 200 lb. per acre; sweet corn: 21-0-0, 125 lb. per acre. With the exception of cucumbers, fertilizer mixtures produced as high, or nearly as high, yields as manure-fertilizer combinations. Side dressings of sulphate of ammonia showed a beneficial effect only in the case of cabbage and sweet corn, but with the latter only in the absence of manure.

2093. TIMOFEEV, N. N. 581.45: 635.34+635.52
The relation of head quality to length of growing period in cabbage, lettuce, etc. [Russian.]
Proc. sci. Conf. Timirjazev agric. Acad., 4-11 June 1945, 1946, pp. 69-73.
Experiments made with 75 cabbage and 43 lettuce hybrids from crosses between early and late varieties indicated that a relationship exists between the quality of the head and the length of the vegetative period. The head in very late varieties is always large, solid and white on being cut, but in the very early varieties it is mostly small, light and greenish. Growers have attempted in the past to breed early varieties of the above crops with large, solid and cream-white heads. Such attempts, however, were attended with many difficulties and were often unsuccessful. Examination of numerous hybrid cabbages and lettuces showed that the middle and lower portions of the stem contain large leaves, whereas the upper portion produces small leaves. These vary in number and size, according to the length of the vegetative period. If attention is given by breeders to the location, form and size of leaves, the production of early varieties with the desired quality of the head is considered possible. The investigations carried out to prove this point will be reported in a subsequent paper.

2094. HEWEY, G. E. R. 635.34: 632.753
Effect of various dust mixtures on incidence of the cabbage aphid.
J. econ. Ent., 1946, **39**: 265, bibl. 7, being *J. Pap. N. York St. agric. Exp. Stat.* **664.**
Cabbage aphid (*Brevicoryne brassicae*) infestation was found to be heavier in plots treated with different insecticides against cabbage worm than in check plots, applications of lead arsenate and cryolite favouring aphid development particularly. The observation is discussed in the light of the literature published on related subjects.

2095. BRUCE, W. N., AND TAUBER, O. E. 635.1/7: 632.951
Trial with DDT on potatoes, cabbage and squash.
J. econ. Ent., 1945, **38**: 439-41, being *J. Pap. Iowa agric. Exp. Stat. J.* **1271.**
(1) Imported cabbage worm. Apparently, a 1% DDT dust controlled the pest more effectively than a 1% rotenone dust. (2) Squash vine borer. A 3% DDT dust gave a more complete control of the pest than 1% rotenone or 8% calcium arsenate, and resulted in a great increase in yield. While the Hubbard and Buttercup varieties of squash did not exhibit any foliage injury from DDT treatment, acorn squash and some muskmelon varieties were found to be retarded in their development.

2096. MINISTRY OF AGRICULTURE, LONDON. 635.35
Cauliflowers.
Bull. Minist. Agric. Lond. **131,** 1945, pp. 15, 9d.
The expert committee which compiled this bulletin provides one of the most practical of the Ministry's recent bulletins. We note with relief that there is no hard and fast dividing line between broccoli and cauliflower, broccoli being merely a winter-hardy cauliflower. Varieties and their seasons are here listed. The cultivation of both winter- and summer-grown cauliflowers is described here in considerable detail with the help of very clear illustrations, including the operation of mechanical planting. No less attention is

paid to harvesting and packing technique and on clearing the harvesting land of stumps. Brief notes are given on cauliflowers for pickling, on Cape broccoli, pests and diseases and their control. The bulletin ends with notes on particular local practice in Cornwall, Devon, Kent, Lincolnshire, Yorkshire and Derbyshire as regards winter cauliflower and in Lancashire, Lincolnshire, Worcestershire and the South of England for summer cauliflowers.

2097. HUCKETT, H. C. 632.78: 632.951
DDT and other new insecticides for control of cauliflower worms on Long Island.
J. econ. Ent., 1946, **39**: 184-8, bibl. 6, being *J. Pap. N. York St. agric. Exp. Stat.* **650.**
DDT in various forms and concentrations was compared with rotenone treatments with regard to its effectiveness against aphids (*Myzus persicae*) and thrips (*Thrips tabaci*) in cauliflower seedbeds. DDT dusts were found to be slightly superior to cubé dusts, while sprays of the two materials were about equally effective. In a comparative test of DDT, pyrethrum, cubé, sabadilla and *Ryanex* dusts against worms, chiefly *Autographa brassicae*, of autumn cauliflower crops, DDT gave very much better results than the insecticides of plant origin. This may be due to the long intervals between applications adopted in deference to DDT. Still, a 20% sabadilla powder showed promise. It is noted with satisfaction that DDT sprays were shown to control cauliflower worms very well.

2098. WALLACE, C. R. 632.76: 635.35
Protection of plants from black beetle by DDT applied to the soil.
J. Aust. Inst. agric. Sci., 1945, **11**: 135-9.
Experiments are described in which soil treated with DDT was applied to marigold and cauliflower seedlings at the time of planting to protect them against attacks by black beetle, *Heteronychus sanctae-helenae*. The procedure was as follows: The dibble holes were filled with water. When this had drained away the seedlings were put in the holes which were then filled with fine soil which had been thoroughly mixed with 4% DDT-pyrophyllite dust at the rate of 9·9 oz. dust to one gallon of soil. When planted the seedlings were again watered. One gallon of the soil and dust mixture sufficed for about 13 seedlings. It is concluded from the results obtained that the method will enable a grower to secure a sound crop of marigolds or cauliflower in face of fairly severe beetle attack. [See also *H.A.*, 16: 234.]

2099. HADDOCK, M. J. 632.76: 635.34/36
Observations on the species of flea beetles infesting brassica crops in the west of England.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 166-9, bibl. 2.
The so-called turnip fly or flea beetle is not one but many species and as many as eight may be involved in attacks on brassicas. Those most common in the West of England in 1944 and 1945 were *Phyllotreta atra, diademata* and *undulata*. These species showed little preference for any one crop, and kale, cabbage and other crops were equally subject to attack. Among market garden crops radish and kohl-rabi were also found to be infested by a range of flea beetle species.

2100. POTTER, C., AND PERKINS, J. F. 635.34/35: 632.951
Control of brassica pests by DDT.
Agriculture, 1946, **53**: 109-13.
Data are given of trials carried out at Rothamsted during 1944 and 1945. (1) The pollen beetle, *Meligethes aeneus*, was effectively controlled by a 5% DDT dust, several applications being required to extend the protection throughout the flowering period. Dusting did not interfere with the setting of seed, although some toxicity to bees was evident. The cabbage stem weevil, *Ceutorrhynchus assimilis*, was apparently unaffected. (2) A 5% DDT dust and th 0·2% DDT spray gave excellent control of cabbage cate pillars, including the larval stages of the large cabbage whit butterfly, *Pieris brassicae*, the small cabbage white butterfly *P. rapae*, the cabbage moth, *Mamestra brassicae*, the garde pebble moth, *Pionea forficalis*, and the diamond back moth *Plutella maculipennis*. There were indications that sprayin was rather more efficient than dusting. Infestation b cabbage aphis, *Brevicoryne brassicae*, was not controlle but numerous *Hymenoptera* of the genus *Aphidius*, parasit on aphids, were found dead in the bases of the leave (3) Mustard beetles, *Phaedon cochleariae*, that had migrate from dried-up watercress to surrounding brassicas, we controlled by 5% DDT dust and 0·2% DDT spray. (Promising results were obtained with DDT, among other against the following horticultural pests: pea and bea weevils; *Sitona* sp. on tick beans; woodlice on tomat seedlings; larvae of the small ermine moth, *Hyponomeut cognatella*, on *Euonymus*. The treatment proved unsucces ful against bean aphis (*Aphis fabae*), the brown sca (*Lecanium cornii*) on flowering currants, and against r spider.

2101. WITTWER, S. H., AND HASEMAN, L. 635.41: 632.73: 631.416.1
Soil nitrogen and thrips injury to spinach.
Science, 1946, **103**: 331-2.
To ascertain the relation in spinach between resistance attack by thrips (*Heliothrips haemorrhoidalis*) and t concentration of soil nitrogen, New Zealand spinach w grown under controlled conditions in a series of soil trea ments supplying calcium and nitrogen levels each of 5, 1 20, and 40 milliequivalents per pot, with all possible cor binations of those amounts. Calcium acetate and ammo ium nitrate were the respective sources of the variat elements, other nutrients being in constant amounts. T plants were placed in a greenhouse infested with thrip During the first month of growth not one of the plan grown at the two higher nitrogen levels was noticeab attacked, while plants at the two lower nitrogen levels we practically all seriously injured. When the calcium supp was increased, the insect attacks on the low-nitrog groups was less serious. As the plants matured the thr shifted from the plants in the two lower calcium series soils low in nitrogen to those highest in this nutrient, wh the damage in the higher calcium groups practically ceas for all treatments. The insects invariably selected t light green plants and the older, more mature, leaves preference to those younger and higher in nitrogen.

2102. WITTWER, S. H., AND HASEMAN, L. 635.41: 632.73
Soil nitrogen and thrips injury on spinach.
J. econ. Ent., 1945, **38**: 615-7, being *J. Ser. Pap. Mo. Coll. Agric.* **988.**
A nutritional study of New Zealand spinach, *Tetrago expansa*, showed that high soil nitrogen and calcium lev are associated with a high degree of resistance to attack the common greenhouse thrips, *Heliothrips haemorrhoida* It is suggested that generally soil fertility plays an unc estimated role in pest resistance and that the effectiven of crop rotation in checking insect pests is partly due to restoration of soil fertility. Conversely, where monocult is practised, as with fruit, the resulting soil deficiency wo favour pest development.

2103. DIJKSTRA, S. P. 635.48: 633.88
Proefnemingen met Chineesche rabarber. **(Trials with Chinese rhubarb.)**
Meded. Proefbedr. geneeskr. arom. aanverw. Gewas. Buitenpost, No. 3, 1943, pp. 358-9.
Plants of the Chinese rhubarb were raised from seed. seedlings showed variation among themselves in the col of the petioles (dark red to green with transitional shad and type of inflorescence. Seedlings were selected

egetatively propagated to produce clones. The plants ere raised and the rhizomes examined for their yield of adix Rheis. The rhizome particularly gave a yield higher han that required by the Pharmacopoeia.

2104. OGILVIE, L. 635.52: 632.4
Downy mildew of lettuce: further investigations on strains of *Bremia lactucae* occurring in England.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 147-50, bibl. 16.
wo strains of downy mildew on cultivated lettuce have een differentiated in England. The susceptibility of ifferent lettuce varieties to the two strains has been exam-ned and is here discussed. Downy mildew is found on *actuca serriola* growing wild. Wild lettuce is thus a source f danger to market gardens.

2105. RIBEIRO, D. F. 631.531.17: 635.52
Penicillin action on the germination of seeds.
Science, 1946, **104**: 18.
enicillin was shown to have an inhibitory effect on the ermination of lettuce seed, as was found earlier for sul-hanilamide. The author hoped to show that seeds can be sed for a quantitative determination of penicillin, but so ar he has not achieved more than an approximate estima-ion in his tests.—University of São Paulo, Brazil.

2106. WHITAKER, T. W., AND CARTER, G. F. 635.62
Critical notes on the origin and domestication of the cultivated species of *Cucurbita*.
Amer. J. Bot., 1946, **33**: 10-5, bibl. 14.
he distinguishing features of the three cultivated species f *Cucurbita*, i.e. *C. pepo* (pumpkin), *C. moschata* (cushaw), nd *C. maxima* (giant pumpkin), are discussed and practical riteria for their separation suggested. At least two omestications of *C. pepo* have resulted in distinct varietal ypes. A domesticated form of *C. pepo* from the south-estern United States is described for the first time, and is hown to be quite distinct from the Eastern domesticates f this species from the Atlantic Coast region.

2107. WALTON, R. R. 635.62-2.753
Sabadilla and DDT to control the squash bug.
J. econ. Ent., 1946, **39**: 273.
he tabulated data show that a 5% sabadilla dust, if horoughly applied, will control squash bug. DDT, hough acting slowly, ultimately establishes effective control s well.—Oklahoma Agric. Exp. Station.

2108. WATKINS, T. C. 632.753
An evaluation of various sprays to control immature squash bugs.
J. econ. Ent., 1946, **39**: 255-61, bibl. 11.
Numerous sprays were tested in the laboratory against quash bugs (*Anasa tristis*) eggs and then, beginning with he newly-hatched nymphs, against successively more esistant stages. None of the materials was found to have eally ovicidal properties, but pyrethrum preparations roved effective against young nymphs. Of three DDT ormulae only one made from an oil base and containing % of the insecticide killed the active stages. In future, DDT should be tested at much higher concentrations.—Cornell University, Ithaca, N.Y.

2109. CHENG, T.-H. 635.61: 632.76
Field tests of the thunder god vine against melon leaf beetle.
J. econ. Ent., 1945, **38**: 491-2.
he bark and root of the thunder god vine, *Tripterygium orrestii*, were found to be an insecticidal material of great otential value in China, where other insecticides are either ot obtainable or expensive. The dust, which acts as a tomach poison, proved very effective against the yellow elon leaf beetle, *Rhaphidopalpa chinensis*, a destructive pest of water melons in south and eastern China. Encouraging results were obtained in preliminary trials also against cabbage flea beetle and cabbage leaf beetle. Dusted melon leaves were fed to domestic animals without causing any damage. Neither was there any phytocidal effect.—College of Agriculture, Lingnan University, China.

2110. MAAN, W. J. 635.63: 631.541
Het enten von komkommers. **(Grafting cucumbers.)**
Tuinbouw, 1946, No. 6, pp. 9-15.
Grafting is recommended as a method of controlling *Fusarium* wilt of cucumbers. The desired variety is grafted onto a resistant rootstock, a selected strain of *Cucurbita ficifolia*. Two methods of grafting are described, cleft grafting and tongue-inarching. Fifteen photographs illustrate the methods of grafting and the results obtained.

2111. WAHLIN, B. 635.63: 632.4
Trollosmör i gurkhus. **(A slime fungus in the cucumber house.)**
Växtskyddsnotiser, 1946, No. 2, pp. 28-9.
In a cucumber house in Sweden a slime fungus of the genus *Fuligo* was found to occur, which made very rapid growth—15 cm. in 9 hours in one case—and caused damage. Spraying the soil surface with 1% basic bordeaux mixture (1: 2: 100) or with 0·02% Uspulun solution kept the fungus in check.

2112. HUTTON, E. M. 635.64: 631.523
Present and future trends of tomato varieties in Australia.
J. Aust. Inst. agric. Sci., 1945, **11**: 128-34.
The paucity of all-round, really good varieties of tomato in Australia is emphasized. The qualities looked for in new varieties are enumerated. They include good field resistance to *Fusarium* blight and early blight; but this character is not stressed since the largest irrigated tomato areas in Australia are remarkably free from serious disease. In irrigated districts with a sandy soil *Fusarium* wilt sometimes becomes troublesome, so that resistance would be a distinct advantage in any new variety. An agronomic analysis of 27 varieties grown under unstaked conditions is tabulated. Among recently introduced varieties the following are considered promising: Red Cloud, Sioux, Tatinter, Pennheart, Valiant and Morse's Special Early.

2113. CHOUARD, P., GUÉDRON, P., AND MARISCAL, R. 635.64
Essais préliminaires sur la normalisation des variétés de tomates en rapport avec leurs divers usages. **(Classification of tomato varieties according to their use.)**
Reprinted from *Procès-verbal Acad. Agric. France*, Séance, 15 Fevr., 1945, pp. 6.
No information exists on the special suitability of the 40-60 tomato varieties grown in France for such different purposes as fresh consumption, cooking, canning, juice production, etc. Preliminary trials were therefore carried out at the Conservatoire National des Arts et Métiers, Colombes, near Paris, during the years 1942-44. The tests, to which the varieties were subjected, included earliness, distribution of yield over the harvest period, total yield, size and shape of fruits, dry matter content, sugar content, vitamin C content, proportion of seeds and proportion of skin.

2114. WENT, F. W., AND COSPER, L. 635.64
Plant growth under controlled conditions. VI. Comparison between field and air-conditioned greenhouse culture of tomatoes.
Amer. J. Bot., 1945, **32**: 643-54.
With 5 tomato varieties grown in 8 localities in S. California it was found that the growth rate of stem elongation, when plotted against mean minimal temperature during the

measuring interval closely followed the growth rate of the same varieties in the greenhouse, and showed that night temperature was the main factor controlling stem growth rate. Market fluctuations in fruit production, especially in the Stone and Beefsteak varieties, were correlated with high minimal (night) temperatures (at least 15° C.) occurring one month before ripening (coinciding with the period of fruit-set). In the Earliana variety, which sets at lower night temperatures in the greenhouse, no such correlation with periods of high minimal temperature was found. (For abstracts of other papers in this series see *H.A.*, 14: 1763; 16: 335 and 925.)

2115. Raleigh, G. J. 635.64
The effect of various ions on guttation of the tomato.
Plant Physiol., 1946, **21**: 194-200, bibl. 6, being *Pap. Dep. Veg. Crops, Cornell Univ.* **276.**
Tomato plants were grown in complete solution and then transferred to solutions deficient in one particular element. It was found that on supplying the lacking nutrient to the deficient solution marked guttation occurred at a relative humidity of about 94% in the case of NPK, while Ca and Mg did not cause guttation.

2116. Erickson, L. C. 635.64: 581.144.2
Growth of tomato roots as influenced by oxygen in the nutrient solution.
Amer. J. Bot., 1946, **33**: 551-61, bibl. 46.
Three types of experiments were conducted: Plants were grown (1) in aerated and non-aerated culture solutions for 5 weeks, with oxygen and carbon dioxide determinations made at fortnightly intervals, (2) in water cultures maintained at 25° C. and aerated with mixtures of gases in which the partial pressure of oxygen was varied, (3) in water cultures maintained at 25° C. and aerated with mixtures of gases in which the partial pressure of carbon dioxide was varied. The growth responses obtained indicated that the characteristic differences observed between tomatoes in aerated and non-aerated water cultures were produced by insufficient oxygen in the solution and that these differences developed before the concentration of carbon dioxide reached a value that might have been slightly toxic.

2117. Rick, C. M. 635.64: 581.145
The development of sterile ovules in *Lycopersicon esculentum* Mill.
Amer. J. Bot., 1946, **33**: 250-6, bibl. 12.
Ovule abortion in genetically unfruitful tomato plants was found to consist of two types. In the *collapsed* type the ovule develops normally until four megaspores are produced; the gametophyte may then degenerate in various stages until differentiation of a mature embryo sac. Collapse of the gametophyte is accompanied by hypertrophy of the inner layer of integumentary cells. Triploids and tetraploids are characterized by ovule sterility of the collapsed type. In the *substitution* type a megaspore mother cell never differentiates; there is no semblance of normal development of a gametophyte and the nucellar apex remains as a group of living undifferentiated cells, which persists in the ovule until anthesis.

2118. Luckwill, L. C. 635.64: 577.17
Fruit-setting sprays for tomatoes.
Agriculture, 1946, **53**: 262-5, bibl. 5.
While parthenocarpic tomato fruits induced by applications of 2.4-D are often of irregular shape and incompletely filled, the use of β-naphthoxyacetic acid (BNOA) is free from these disadvantages. Fruits thus produced are slightly richer in sugar content than normal, seeded tomatoes, but otherwise of similar composition. The spray has been commercially used with success both for outdoor and glasshouse crops, when conditions for pollination were unfavourable. Further investigations appear to be necessary before the aerosol method, already used in America, can be recommended for Britain. Spraying of a truss should be delayed until the last flowers are opening. Feeding experiments have shown no harmful effects on animals even at relatively high concentrations. Strawberries can also be induced to swell, where pollination has failed, and useful results with raspberries and blackberries have been reported. With top fruit, however, growth substance treatment does not provide a substitute for natural pollination.

2119. Nicholas, D. J. D., Jones, J. O., and Wallace, T. 635.64: 632.19
Experiments on the control of magnesium deficiency in glasshouse tomatoes. Progress Report III.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 80-94, bibl. 4.
Results obtained at 4 centres in 1945 confirmed those of 1944. To control the deficiency by soil application at least 10 cwt. magnesium sulphate per acre was necessary. Increasing this to 15 cwt. or more gave no appreciable advantage. Moreover the application of 16 cwt. had little effect on the incidence of the deficiency in the following year. Foliage spray treatments were superior both as regards control and economy of chemical. Complete control was achieved by spraying the foliage 4 or 5 times at intervals of 3 weeks throughout the growing season with a 2% or 1% solution using, incidentally, only 1¼ cwt. of the material. Slight leaf injury followed spraying on dull days, hence sunny conditions should be chosen. Liquid application to the soil in amounts equal to those given in the 2% spray were relatively ineffective.

2120. Hunter, J. G. 635.64: 632.19: 546.46
Magnesium chlorosis of tomatoes.
Nature, 1946, **158**: 25, bibl. 5.
It was shown in sand culture experiments that magnesium absorption of tomatoes decreases with increasing concentration of the nutrient solution, the induced chlorosis being most severe when the ratio of potassium to magnesium is high. The trouble was associated particularly with the use of potassium sulphate as a fertilizer, although excessive applications of other potassic fertilizers also induced the deficiency. In view of the harmful effect of increasing the concentration of the solution still further, induced chlorosis cannot be cured by magnesium applied to the soil. Control by spraying the foliage with magnesium sulphate solution does not seem practicable in the area of the West of Scotland Agricultural College, where these experiments were carried out. Where chlorosis persists in the presence of low potash applications, resoiling is the only cure that can at present be recommended. Preliminary results, however, suggest that early mulching with stable manure or peat, encouraging secondary root formation, will partly offset the conditions under which induced magnesium deficiency appears.

2121. Blencowe, J. W., and Caldwell, J. 635.64: 632.8
A new virus disease of tomatoes.
Nature, 1946, **158**: 96-7, bibl. 1.
This previously unrecorded virus disease of tomatoes was first observed in a commercial outdoor crop during the growing season of 1944. Affected plants are stunted and have a bushy appearance. Fruits on the upper trusses, i.e. those formed after the infection of the plant, are seedless and very much smaller than normal fruits. The virus spreads by sap transmission through an aphis vector. It was found that a bed of chrysanthemums growing nearby, though exhibiting only slight symptoms of disease, was the source of infection. Further observation of tomatoes under experimental and commercial conditions showed that the spread of the virus is rapid and that the reduction in yield caused may be considerable.—University College, Exeter

2122. WAGER, V. A. 635.64: 632.19
Blossom-end rot of tomatoes.
Fmg S. Afr., 1946, **21**: 309-12, bibl. 6.
The following factors involved as possible causes of blossom-end rot of tomatoes are briefly discussed: High concentration of the soil solution as a result of increased water evaporation on a hot day, calcium deficiency, excess of nitrogen in the absence of sufficient phosphate, varietal susceptibility, excessive transpiration on a hot day with strong wind. An experiment carried out in Durban showed the beneficial influence of mulch, which reduced the temperature of bare soil 2 in. below the surface from 113° F. to 81° F. and 6 in. below the surface from 104° F. to 77° F. However, mulching can be practised only when tomatoes are grown on a small scale. Other methods of keeping blossom-end rot in check are frequent watering during a dry spell, cultivation after irrigation to preserve soil moisture, incorporation of humus into the soil, liberal applications of superphosphate when nitrogenous fertilizers or manures are used, and possibly a good dressing of agricultural lime.

2123. SNYDER, W. C., BAKER, K. F., AND HANSEN, H. N. 635.64: 632.48
Interpretation of resistance to *Fusarium* wilt in tomato.
Science, 1946, **103**: 707-8, bibl. 7.
The Pan America tomato, a variety highly resistant to *Fusarium oxysporum* f. *lycopersici*, was used in this study of wilt resistance. Apparently, invasion of the xylem by the fungus is prevented by an inhibitory substance present in the cellular protoplasm of root and other cells. Adding their results to earlier findings the authors come to the following conclusions: "(1) Resistance is not localized in the root system. (2) The substance responsible for the resistance is not present in inhibitory amounts in the xylem stream. (3) Resistance originates in the living tissues of the plant, and the material causing resistance does not migrate or diffuse into xylem vessels. (4) Field resistance to infection functions in living cells of the roots through which the fungus, a soil organism, must pass to become a vascular pathogen."—University of California.

2124. WALKER, J. C., AND FOSTER, R. E. 635.64: 632.48
Plant nutrition in relation to disease development. III. Fusarium wilt of tomato.
Amer. J. Bot., 1946, **33**: 259-64, bibl. 10.
Young tomato plants were grown in sand under greenhouse conditions, using solutions of varying concentrations of all elements. Disease development, in susceptible or intermediate resistant hosts grown at a temperature optimum for wilt, decreased with an increase in nutrient concentration. Unbalanced nutrition brought about an alteration of the susceptibility of tomato plants to wilt which was not correlated with total plant growth. Infected plants receiving a low concentration of potassium or a high concentration of nitrogen showed an increased wilt development. Solutions low in nitrogen or high in potassium brought about a decrease in disease severity.

2125. RICHARDS, M. C., AND JONES, R. C. 635.65: 632.4: 631.8
Effect of inorganic fertilizers on defoliation of New Hampshire Victor tomatoes by *Alternaria solani*.
Abstr. in *Phytopathology*, 1946, **36**: 681.
Tomato leaves appear to become susceptible to attacks by *Alternaria solani* as the nutrients are drained from the leaves by the rapidly developing fruits, so attempts were made by supplying plants with excess N, P and K to maintain a higher level of these nutrients in the leaves during the fruiting period. The results showed that, in general, there was an increase in the total fruits per plant with increases in nutrients applied, so that the high fruit to leaf ratio was maintained, and defoliation was as heavy as on the checks.

2126. RICHARDS, M. C., AND JONES, R. C. 635.64: 632.4
Control of *Alternaria* blight on tomatoes with fungicides.
Abstr. in *Phytopathology*, 1946, **36**: 681-2.
Six applications for each of 18 fungicides were made on tomatoes to control *Alternaria solani*. Highly significant results (99·1) with regard to both defoliation and pounds of marketable fruit were obtained with Puratized, Zerlate, and Phygon.

2127. DORAN, W. L. 631.531: 632.4
Control of damping-off by a delay in first watering after seeding.
Abstr. in *Phytopathology*, 1946, **36**: 679-80.
When seeds were sown in soils infested with *Pythium*, the soils having a moisture content of not more than 30% of the water-holding capacity at time of seeding, damping off, especially pre-emergence damping off, was much less severe if soil was not watered for the first time until several (4 or 5) days after seeding. Marked increases in surviving plants were obtained with tomato, eggplant, pepper, onion, lettuce, beet, and cabbage.

2128. WAGER, V. A. 635.646: 632.3
Egg-plants resistant to bacterial wilt.
Fmg S. Afr., 1946, **21**: 410-12, bibl. 1.
Further trials with the eggplant varieties Matale and Kopek, carried out at the Botanical Station, Durban, and observations of growers to whom seed had been released proved anew the high resistance of these varieties to bacterial wilt caused by *Bacterium solanacearum*. (See *ibidem*, 1944, 19: 621-4; *H.A.*, 15: 744.) Again, Kopek was somewhat superior to Matale. Breeding work at Durban in which the immune Javanese variety Terong Gowok is used, affords some promise that the production of a prolific, large-fruited and immune eggplant is not far distant.

2129. PRICE, W. C. 635.65: 632.8
Purification and crystallization of southern bean mosaic virus.
Amer. J. Bot., 1946, **33**: 45-54, bibl. 31.
The purification and crystallization of southern bean mosaic virus (*Marmor laesiofaciens* Zaumeyer and Harter) are described. The virus differs from other plant viruses in its high degree of thermostability, the symptoms it produces and its host range.

2130. PRICE, W. C. 635.65: 632.8
Accuracy of the local-lesion method for measuring virus activity. IV. Southern bean mosaic virus.
Amer. J. Bot., 1945, **32**: 613-9, bibl. 13.
A method is described for measuring the activity of southern bean mosaic virus (*Marmor laesiofaciens* Zaum. and Harter). The data obtained show that the activity of the virus can be measured with an error that seldom exceeds 10% or 15%, when the proper concentration of the unknown and the standard are chosen for the test.

2131. TURNER, N. 632.951: 635.65
Diatomaceous diluents for dusts.
J. econ. Ent., 1946, **39**: 149-58, bibl. 25.
In the laboratory, 15 diatomaceous samples were studied as diluents for pure ground derris, toxicity tests being made on *Aphis rumicis*. Field tests on the Mexican bean beetle were based on toxicity and tenacity studies made in the laboratory.

2132. DURÁN M., L., AND OLALQUIAGA FAURÉ, G. 635.65: 632.76
Plantas huespedes del bruco comun del frejol determinadas en el valle de Limache. (**The host plant of the bean weevil in the Limache valley.**)
Agric. tec. Chile, 1944, **4**: 230-44, bibl. 14.
The bean weevil, *Acanthoscelides obtectus*, was found living

on seeds of 16 varieties of *Phaseolus vulgaris*, 2 varieties of *P. multiflorus* (*albiflorus* and *coccineus*), *Dolichos lablab*, *Vigna sinensis*, *Vicia faba* f. *megalosperma* and *Cicer arietinum*. *Dolichos lablab* is apparently a new host for this weevil. The entomophagous mite, *Pediculoides ventricosus*, introduces a possible cause of error in the experiments with *A. obtectus*. The experimental technique is described.

2133. FRIEND, A. H. 635.65: 632.76
Experiments on the control of the bean seed weevil.
J. Aust. Inst. agric. Sci., 1945, **11**: 139-41.
Results are given of two experiments in which various dusts were evaluated for their efficiency in protecting bean seed against the attack of the bean seed weevil, *Bruchus* (*Acanthoscelides*) *obtectus* Say. They show that there is no doubt that DDT will protect bean seed from attack, although 1 lb. of 10% dust per bushel appears to be an excessive application; the treatment resulted in no holed seeds while in the control holed seeds were 98%. Spergon, the recommended fungicidal seed dust for beans, showed no promise for control of the weevil.

2134. OLALQUIAGA FAURÉ, G. 635.65: 632.76
Origen y dispersion de algunos bruquidos del frejol en Chile. **(Origin and distribution of certain bean weevils in Chile.)**
Agric. tec. Chile, 1944, **4**: 41-53, bibl. 25.
A review of the literature on the bean weevils *Acanthoscelides obreptus*, *A. obtectus* and *Zabrotes subfasciatus* in Chile, and an account of their distribution in that country, with references to the activities of the DSV (Departmento de Sanidad Vegetal) in controlling these pests.

2135. HAWKINS, J. H. 635.65: 632.951.23
Effect of calcic and magnesic diluents of calcium arsenate on bean yields.
J. econ. Ent., 1946, **39**: 145-8, bibl. 7.
Bean yields from plots treated with dusts containing calcium arsenate, monohydrated copper sulphate and high calcic or magnesic hydrated spray lime were compared with yields from untreated check plots over a seven-year period. The toxic effect of the insecticide upon the bean plants was much more than offset in years with severe bean beetle infestation, but dusting had little, if any, beneficial effect in years with light infestation. High magnesic lime proved to be a much safer diluent than high calcic lime, though a mixture containing the former had at least equal control value. Over the whole period, applications of the high magnesic lime-monohydrated copper sulphate-calcium arsenate dust increased bean yields by 19·2% as compared with the controls.—Maine Agricultural Experiment Station.

2136. HEDGES, F. 635.653: 632.3
Experiments on the overwintering in the soil of bacteria causing leaf and pod spots of snap and lima beans.
Phytopathology, 1946, **36**: 677-8.
There is good circumstantial field evidence that *Xanthomonas phaseoli* (E.F.Sm.) Dowson survives the winter in bean plants thrown on compost heaps, but experiments carried out by the author to test overwintering in the soil of the bean pathogens, *Xanthomonas phaseoli*, *Pseudomonas medicaginis* var. *phaseolicola* and *Pseudomonas syringae*, gave negative results in Maryland.

2137. BAKER, K. F., AND SNYDER, W. C. 635.653
Seed pitting of the lima bean by lygus bugs in California.
Science, 1946, **103**: 500-1.
It is established that the toxic feeding of lygus bugs is responsible in the California lima bean crop for a seed spotting and pitting, and for some of the dropping of blossoms and pods.

2138. ANON. 635.655
Soya bean.
Curr. Sci., 1946, **15**: 158-9.
This is a review of "Report on Soya Bean" by the Soya Bean Sub-Committee of the Nutrition Advisory Committee, Indian Research Fund Association, January 1946, pp. 35; price As. 8 only. The review concludes with these words: "The Indian Research Fund Association deserve to be congratulated not only for providing an authoritative report on the vexed question of soya bean, but also for demonstrating an effective way through which controversial issues in the field of scientific endeavour could be authoritatively settled."

2139. SCULLY, N. J., PARKER, M. W., AND BORTHWICK, H. A. 635.655: 612.014.44+631.84
Relationship of photoperiod and nitrogen nutrition to initiation of flower primordia in soybean varieties.
Bot. Gaz., 1945, **107**: 218-31, bibl. 18.
In the four soybean varieties investigated longer photoperiods were found to delay the initiation of flower primordia. With increasing amounts of nitrogen two of the varieties showed an increasing number of nodes bearing flower primordia, while the third and fourth variety gave no significant reaction and showed the reverse trend respectively. Soybeans planted in late spring, i.e. when photoperiods are least conducive to flowering, were found to exhibit the greatest difference in their response to variation in nitrogen treatment. The effect on yield of differences in flowering behaviour and of some other characteristics studied is not yet known.

2140. KRAMER, A., AND OTHERS. 664.84.655.036
Chemical and nutritional studies of canned vegetable soybeans.
Bull. Md agric. Exp. Stat. **A39**, 1945, pp. 67-86, bibl. 33.
No outstanding differences were found among the varieties analysed. When soybeans are harvested at the optimum stage of maturity for canning as a green vegetable, the canned product contains the highest quantities of protein, fat, ascorbic acid, and carotene. Beyond the optimum stage, increased maturity is associated with a decrease in protein, fat, calcium, phosphorus, iron, complete loss of ascorbic acid and carotene, no change in thiamin and an increase in carbohydrates. [From authors' summary.]

2141. SHERWIN, H. S., AND OTHERS. 635.655: 631.531.17
Effect of seed treatment on soybean germinated at four temperatures.
Abstr. in *Phytopathology*, 1946, **36**: 688.
Seedling emergence of soybeans was significantly increased when the seed was treated with Arasan, New Improved Ceresan, and Spergon, and planted in soil maintained at 15°, 20° and 25° C.

2142. CERIGHELLI, R. 635.655: 631.531
Faculté germinative et conservation des graines de soja. **(Germination of soybeans in relation to time of storage.)**
C.R. Acad. Agric. Fr., 1946, No. 10, pp. 412-5.
Among the soybean varieties studied there are many with seeds that do not germinate within the 6 days generally allowed in tests. After being kept for 2½ years germination was found to decrease slightly in a few varieties (4 out of 26). In some varieties there was no change and in others actually increased.

2143. STRUCKMEYER, B. E. 635.655: 632.19
The anatomy of the abnormal swellings on the stems of some varieties of soybeans.
Amer. J. Bot., 1946, **33**: 571-7, bibl. 10.
Soybean var. Illini responds to photoperiod as an indeterminate type. It blossoms in both short and long days.

short days with cool nights swellings (diameter about three times that of normal stems) occur on the third and fourth internodes. Plants with these abnormal swellings remained green while the normal ones had mature fruits and had dropped their leaves. The anatomy of these stem swellings is described in detail.

2144. ELIASSON, S., AND JACOBSON, G. 635.656
Sortförsök med ärter och baljväxtblandsäd. **(Swedish variety trials with peas and with different leguminous crops mixed with oat s.)** [English summary 4 pp.]
Meddel. JordbrFörsöksanst. LantbrHogskol. **17**, 1946, pp. 108, bibl. numerous.

The Swedish variety trials with peas, hitherto carried out on a small scale, were put on a country-wide basis in 1940, the present report covering the period 1940-44. The majority of the varieties tested were raised at the Plant Breeding Stations Svalöv and Landskrona. The trial results are discussed separately for five regions of the country. In general, the pea weevil was shown to be equally injurious to early and late varieties. Pure clay soils proved to be superior to other soils for pea growing. In southern and central Sweden peas were found to yield best when following pasture and roots in the rotation, while in northern Sweden cereals were the most suitable preceding crop.

2145. COOK, R. P., AND BROWN, M. B. 633.88: 635.656
Penicillin production on juices from various parts of the pea plant.
Biochem. J., 1946, **40**: xxii-xxiii, bibl. 3.

The author had previously shown (*ibidem*, 1945, 39: 314-7) that the juice from green seed peas in pod forms a good basis for a medium for penicillin production. It has now been found that *Penicillium notatum* growth is very good also on media to which was added juice expressed from waste parts of the pea plant. In view of the high yield of juice obtained and in view of its relatively high dry matter concentration it is suggested that juice made from waste pods and/or haulms might be of value as a stock fodder.

2146. HEINTZE, S. G. 635.656: 632.19: 546.711
Manganese deficiency in peas and other crops in relation to the availability of soil manganese.
J. agric. Sci., 1946, **36**: 227-37, bibl. 18.

Crops sensitive to manganese deficiency are generally healthy on soils with more than 0·3 mg. exchangeable Mn%, but they may also be healthy on soils with less than this amount. Manganese deficiency in crops on a number of fen and other soils was found to occur where the soil had both low exchangeable manganese and high nitrifiable nitrogen. Pot experiments showed that the control of marsh spot in peas required an adequate supply of manganese throughout the whole period of seed formation. Manganese accumulated in the plant before flowering is ineffective. Marsh spot could be induced in peas grown on a soil rich in available manganese by injecting simple inorganic and organic nitrogen compounds into the plant. In field experiments manganese sulphate and basic slag applied to marsh soils before sowing peas reduced the amount of marsh spot but not sufficiently to justify the use of these materials on soils which rapidly oxidize manganous compounds. The laboratory and pot culture experiments support the practical recommendation of late sprayings with manganese salts on such soils. [From author's summary.]

2147. GLASGOW, H. 635.656: 632.753
DDT as a control for the pea aphid.
J. econ. Ent., 1946, **39**: 195-9, bibl. 1, being *J. Pap. N. York St. agric. Exp. Stat.* **661.**

In one season's experiments a 5% DDT dust proved outstandingly effective against the pea aphid. The insecticide was tested also as a spray and as an aerosol, the problem of equipment being discussed for the different kinds of applications.

2148. DITMAN, L. P., AND OTHERS. 635.656: 632.753
Insecticidal aerosols for pea aphid control.—Second report.*
J. econ. Ent., 1946, **39**: 199-204, bibl. 1, being *Sci. Pap. Md agric. Exp. Stat.* **114.**

Aerosols containing 5% of DDT in various formulas were applied to about 100 acres of Alaska and varieties of wrinkled peas with a dispenser designed for commercial use mounted on a jeep. Treatments with dosages of 0·5 lb. of DDT per acre, at speeds of 3 to 5 miles per hour, were more uniformly effective than higher speeds and lower dosages. Nozzles having an output of 3 gallons per hour were comparable to the previously used 2-gallon-per-hour nozzles. Successful treatments were made during varying weather conditions, including temperatures between 54° and 84° F., wind velocities up to 20 miles per hour, and in sunshine as well as rain. Treatments resulted in 97% to 99% reduction of the aphids and in yield increases of 10% to 67% where the infestations were heavy. Better control of aphids and greater increase in yield of peas were obtained on Alaska peas than on wrinkled varieties, but this may have been due in part to differences in vigor of the infestations. Nozzle stoppage due to corrosion particles or formation of crystals was largely corrected by including a methylated naphthalene in the solution, adding 1% of propylene oxide to combine with any free acids, and installing a filter in the line. [Authors' summary.]

2149. DITMAN, L. P. 635.656: 632.753
DDT preparations for control of the pea aphid.
J. econ. Ent., 1946, **39**: 219-22, being *Sci. Pap. Md agric. Exp. Stat.* **A113.**

DDT emulsion sprays gave excellent kills of pea aphid, but caused some injury in certain formulae. The following formula is recommended as safe: Xylene or ethylene dichloride, 390 c.c.; DDT, 227 g.; and Triton X-100, 200 c.c., to be diluted with water to make up the amount of spray needed for treating one acre. DDT sprays were superior to rotenone sprays at relatively high concentrations.

2150. TERRIER, C. 635.8
Méthode de préparation du blanc de champignon de couche (*Psalliota campestris*). **(The preparation of spawn of the cultivated mushroom.)** [German summary ½ p.]
Landw. Jahrb. Schweiz., 1945, **59**: 949-52.

War conditions have made it necessary for Swiss mushroom growers to produce their own spawn. A simple method of obtaining a bacteriologically pure product was therefore worked out at the Lausanne Research Station.

2151. ASHBY, K. H. 635.8
Mushrooms out of doors.
Gdnrs' Chron., 1946, **120**: 175-6.

It is contended that mushrooms can be grown out of doors in a small garden as successfully as cabbages and take up proportionately less space. The making of a mushroom bed with a mixture of straw and horse dung covered by specially prepared soil is described. The crop can be grown nearly all the year round, yielding about 15 lb. to the yard run.

2152. COHEN, P. P. 635.65: 581.192
a **The carboxylase activity of jack beans (*Canavalia ensiformis*) and soy beans (*Glycine hispida*).**
J. biol. Chem., 1946, **164**: 685-9, bibl. 8.

b COOK, R. P., AND OTHERS. 635.656: 633.88
The production of penicillin using fractions obtained from aqueous extracts of pea (*Pisum sativum*).
Biochem. J., 1945, **39**: 314-7, bibl. 11.

c DAWSON, R. F. 633.71: 581.192
Development of some recent concepts in the physiological chemistry of the tobacco alkaloids.
Plant Physiol., 1946, **21**: 115-30, bibl. 49.

* For first report see *ibid.*, 1945, 38 : 183-8 ; *H.A.* 15 : 1847.

d EGGERS, V. 633.52-1.84
Influence of carbohydrate and nitrate-nitrogen nutrition on development of hypocotyledonary buds in flax.
Bot. Gaz., 1946, **107**: 385-90, bibl. 4.

e GILMORE, J. U., AND LEVIN, C. 633.71-2.76
Effect of ferric dimethyl dithiocarbamate on emergence of tobacco flea beetles from plant-bed soil.
J. econ. Ent., 1945, **38**: 599-600, bibl. 4.

f HILBERT, G. E., AND MACMASTERS, M. M. 635.656: 581.192
Pea starch, a starch of high amylose content.
J. biol. Chem., 1946, **162**: 229-38, bibl. 12.

g MILES, H. W., FINNEY, D. J., AND ANSCOMBE, F. J. 632.76: 632.95
Insecticidal dusts against flea beetles.
Agriculture, 1946, **53**: 58-66, bibl. 2.
A report from the conference of Advisory Entomologists.

h VAN DER PLANK, J. E. 633.491: 612.014.44
Origin of the first European potatoes and their reaction to length of day.
Nature, 1946, **158**: 168, bibl. 6.

i SCHLAMOWITZ, M., AND GARNER, R. L. 635.655: 581.192
The ribonucleinase of the soy bean. I. Isolation of the enzyme.
J. biol. Chem., 1946, **163**: 487-97, bibl. 22.

j SPARROW, F. K. 633.913
Types of pods of *Asclepias syriaca* found in Michigan.
J. agric. Res., 1946, **73**: 65-80, bibl. 2.

k DE VILLIERS, P. C. 633.491-1.532.2
The production of seed potatoes.
Fmg S. Afr., 1946, **21**: 71-4, 91.

l WAGER, H. G. 633.491
Quality of potatoes in relation to soil and season. I. The content of dry matter. II. The colour of the cooked potato.
J. agric. Sci., 1946, **36**: 207-13, bibl. 29 and **36**: 214-21, bibl. 19.

m WAGER, H. G. 633.491
The effect of pH on stem-end blackening of potato.
Biochem. J., 1945, **39**: 482-5, bibl. 11.

FLOWERS AND ORNAMENTALS.

2153. GOULD, N. K. 634/635: 58.006
The Wisley Gardens and their development.
J. roy. hort. Soc., 1946, **71**: 215-24, bibl. 5.
The Royal Horticultural Society purchased Wisley Gardens in 1904, in the year of its centenary. A brief account is given here of the present layout.

2154. VAN STUIVENBERG, J. H. M. 635.966
Gebruik van afwijkend gasmilieu bij vervoer en opslag van snijbloemen. **(The use of gas mixtures in the transport and storage of cut flowers.)**
Tuinbouw, 1946, No. 6, pp. 5-8.
The favourable results of preliminary experiments on the preservation of cut flowers for export by exposing them for various periods in atmospheres with high CO_2 content are described and illustrated by photographs.

2155. VAN STUIVENBERG, J. H. M. 635.966
Het vervoer van snijbloemen per vliegtuig. **(Transporting cut flowers by aeroplane.)**
Tuinbouw, 1946, No. 5, pp. 8-10.
In connexion with aeroplane transport the author carried out experiments on the influence of growth regulating substances during the transport and storage of cut flowers. He discusses the use of such substances in breaking the rest period and in delaying blooming, with particular reference to roses. It was found that cumarin in high concentrations delayed flowering, while at lower concentration it had a stimulating effect. Cumarin as vapour also stimulated blooming. Ethyleneglycoldiacetate had a strong delaying influence on blooming, but at high concentrations it caused leaf scorch.

2156. MCCLELLAN, W. D., AND STUART, N. W. 631.535: 632.952: 577.17.
The effect of fungicide-growth-substance combinations on herbaceous cuttings.
Abstr. in *Phytopathology*, 1946, **36**: 687.
Cuttings of geranium, snapdragon, chrysanthemum, and carnation were set in sand after dipping in dry talc, Spergon, Arasan, and Phygon alone or containing 0·1, 0·04 or 0·02% of naphthaleneacetic acid, naphthalene acetamide or indolebutyric acid. The three fungicides reduced the percentage rooting in all species except geranium. Undiluted Arasan severely injured chrysanthemum but not carnation cuttings. Spergon was not injurious to chrysanthemum but severely injured carnation cuttings. Addition of growth substance to the talc-fungicide mixture increased the percentage and amount of rooting.

2157. WILSON, G. F. 632.6/7: 635.976/7
Some pests of deciduous ornamental trees and shrubs.
J. roy. hort. Soc., 1946, **71**: 193-202, bibl. 10.
The article supplies much information in a condensed form both on general precautionary measures and on control measures against particular pests. Lists are given of aphid, scale, caterpillar, and beetle and weevil pests, together with their host plants and notes on type of injury and months when found.

2158. INGRAM, C. 635.938.36
Two new rock roses.
Gdnrs' Chron., 1946, **120**: 66.
The new rock rose species, *Cistus palhinhaii* Ingram, introduced to England from Portugal in 1939 and described *ibidem*, 1943, 114: 34-5, has proved hardy in Kent and of outstanding beauty. It has given rise to two fine hybrids, *C. paladin* and *C. elma*, with *C. ladaniferus* and *C. laurifolius* respectively as pollen parents.

2159. BAKKER, J. 631.544: 635.937.34
Kasrozen. **(Greenhouse roses.)**
Tuinbouw, 1946, No. 4, pp. 14-8, bibl. 3.
Failures in growing roses under glass are due to disease in the plants and to unsuitable soil conditions, i.e. "rose-fatigue", too high concentration of salts, unbalanced manuring, lack of trace elements, unsuitable pH reaction and the soil structure. Rose-fatigue (soil sickness) can be overcome by steaming the soil, and methods are described and illustrated. The conclusions drawn as a result of soil treatment by steam are: (*a*) In the first year it has a favourable effect on growth, and also in the second and third years good yields are obtained, (*b*) The quality of the cut flowers is increased, (*c*) Old varieties react more strongly to steaming than those recently acquired, (*d*) The reason for the favourable effect by steaming is not yet clear.

2160. COCHRAN, V. W. 635.937.34: 632.452
The common leaf rust of cultivated roses, caused by *Phragmidium mucronatum* (Fr.) Schlecht.
Mem. Cornell agric. Exp. Stat. **268**, 1945, pp. 39, bibl. 58.
The primary purpose of this investigation was to determine

the environmental factors that control the range and seasonal incidence of the rose rust. Control measures are not discussed.

2161. BAKKER, J. 635.937.34: 632.4
Sterfte in den jongen rozenaanplant, voorjaar 1946. (**Mortality in a young rose plantation, spring 1946.**)
Meded. Direct. Tuinb., 1946, pp. 540-2.
A severe outbreak of wilting of grafted and seedling roses is described; it is attributed to infection by a species of *Coniothyrium* [? *C. fuckelii*]. The disease is under investigation.

2162. BARTHELET, J. 635.936.69: 632.4
Le mildiou de l'oeillet. (**Carnation mildew.**)
C.R. Acad. Agric. Fr., 1946, **32**: 575-7.
Carnation (downy) mildew is a disease of limited distribution and up to the present has not been described. It has been confused with other diseases (Fusarioses) and so has escaped notice. It appears to be confined to the double perpetual carnations. Favoured by the wet weather it was particularly severe in the spring of 1946. The disease affects the leaves and flower stalks of plants grown in frames, but it continues to develop after the carnations are planted out. The leaves become pale green, then yellow and finally dry up. The fungus is described under the name *Peronospora dianthicola* nov. sp. A short list of species shows their relative resistance to the disease; at one end is Marie Chabaud and Etincelant with 100% diseased plants, and at the other Enfant de Nice girofié and Enfant de Nice rouge showing no disease. Spraying with copper-containing fluids, with casein as an adhesive, is recommended.

2163. CHENERY, E. M. 635.937.17: 581.175.11
Are hydrangea flowers unique ?
Nature, 1946, **158**: 240-1, bibl. 11.
The possibility that plants other than hydrangea exist which display a colour change as a result of varying soil reaction depends on three conditions: (1) They must have a delphinidin flower pigment; (2) they must be able to accumulate aluminium, and (3) they must have a wide range of reaction tolerance. A search of blue-flowering aluminium plants has yielded a list of species, some of which, it is hoped, wil repeat the hydrangea phenomenon, when grown under conditions of high and low soil acidity.

2164. LIHNELL, D. 635.939.124: 634.11
Azaleor och äpplen. (**Azaleas and apples.**)
Växtskyddsnotiser, 1946, No. 1, pp. 7-10.
A few dozen azaleas loaded together with apples on a boat from Belgium to Sweden showed severe leaf drop and die-back after a fortnight's passage. Later it was experimentally proved that the injury resulted from apple emanations.

2165. STERN, F. C. 635.944
The evolution of the garden iris.
J. roy. hort. Soc., 1946, **71**: 286-90, bibl. 12.
This history of the evolution of the garden iris is based on recent cytological work.

2166. HAWKER, L. E. 635.944: 632.482
Diseases of gladiolus. III. Botrytis rot of corms and its control. IV. Note on the incidence and control of scab diseases (*Bacterium marginatum* McCull).
Ann. appl. Biol., 1946, **33**: 200-8, 209-10.
Control measures for *Botrytis* rot include: (1) Avoidance of heavy wet or infested soil; rogueing diseased plants during the summer and dusting the foliage with pentachloronitrobenzene [p.c.n.] gave some improvement. (2) Early removal of adhering soil, cormels, roots, parent corms and old shoot and leaf bases. (3) Pre-storage fungicidal treatment; dusting with p.c.n. gave good control, but almost complete control was obtained by steeping in a 0·1% solution of mercuric chloride for 20 min. to 3 hours. (4) Corms should be stored in shallow trays in a dry, well-ventilated shed, protected from frost. (5) Dusting at planting time with p.c.n. gave good results. For the control of scab disease, treatment with mercurial fungicides just before planting time gave good control.

2167. BREDDY, N. C. 635.935.722: 632.4
Diseases of lilies.
Gdnrs' Chron., 1946, **120**: 127-8.
The following diseases and their control measures are discussed: (1) Leaf spot, *Botrytis elliptica*, chiefly occurring in *Lilium candidum*; (2) mosaic, to which a number of named species are susceptible; (3) rosette yellow flat, in the British Isles confined to *L. longiflorum*.

2168. GREGORY, P. H., AND GIBSON, G. W. 635.944: 632.4
The control of narcissus leaf diseases. III. *Sclerotinia polyblastis* Greg. on *Narcissus tazeta* var. Soleil d'Or.
Ann. appl. Biol., 1946, **33**: 40-5.
Spraying narcissus Soleil d'Or with bordeaux mixture in districts where *Sclerotinia polyblastis* is prevalent can be recommended as likely to give an increased yield without risk of delaying flowering.

2169. ROEKENS, F. 635.964: 632.4
Bladvlekkenziekte der dahlia. (**Leaf diseases of dahlia.**)
Cult. Hand., 1946, No. 7, p. 27.
Brief descriptions are given of the leaf spots of dahlia caused by the fungi *Entyloma dahliae* Syd. and *Phyllosticta dahliaecola* Brun. Recommendations for control are: In the spring and summer spray with a fungicide (preferably bordeaux mixture) and remove and destroy severely infected leaves. In the autumn when the tubers are lifted destroy infected leaves and stalks, and remove from the tubers as much of the stems as possible. Avoid planting too closely. The ground should be dug deeply and limed, and potash should be applied.

2170. SEFFINGA, J. 635.965.28
Keuringen van cyclamenzaaddragers. (**Inspection of cyclamen seed plants.**)
Tuinbouw, 1946, No. 3, pp. 13-6.
The regulations relating to the state (Holland) inspection of cyclamen seed plants for ensuring purity of strain and vigour of the plants, and the penalties imposed for infringement, are set out. Notes are given on the various characters examined at the inspection.

2171. ROEKENS, F. 635.944: 632.8
Dégénérescence des dahlias. (**Degeneration of dahlias.**)
Courr. hort., 1946, **8**: 97-8.
The sub-title of this article is " The English prohibit the importation of dahlias in order to prevent the outbreaks of diseases causing degeneration ". Mosaic is described as the chief cause of degeneration. The author says the cause of mosaic is not known but his description of the symptoms (plants dwarfed and bearing leaves with pale spots) and the fact that it is transmitted in the tubers suggest that it is a virus disease. The only measures of control are the removal and burning of all affected plants.

2172. INGRAM, C. 635.976.32
a **The rock cherries. *Amygdalocerasus.***
Gdnrs' Chron., 1946, **120**: 138-9, 150-1, 162, 174.
b ISAAC, I. 635.944: 632.48
***Verticillium* wilt of sainfoin.**
Ann. appl. Biol., 1946, **33**: 28-34.
Caused by *Verticillium dahliae*.
c MACEK, J., ROBINSON, G. M., AND ROBINSON, R. 635.944: 581.192
Anthocyanins of *Gladiolus [gandavensis].*
Nature, 1946, **158**: 342, bibl. 1.

d OPPENHEIMER, H. R. 581.14(569)
Some cases of uncommonly rapid plant growth in Palestine.
Palestine J. Bot. (*R.*), 1945, **5**: 112-23, bibl. 25.
Including ornamental trees, climbers and various other plants.

e OSSIANNILSSON, F. 635.965.2: 632.752
Ullöss och rotlöss på rumsväxter. ***(Pseudococcus* species and other lice of house plants.)**
Växtskyddsnotiser, 1946, No. 1, pp. 4-7.

f ÖSTLIND, N. 635.9
Prydnadsväxter bland fruktträden, bärbuskarna och deras närmaste släktingar. **(Ornamentals among fruit trees and bushes and closely related genera.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 250-60.

g SMITH, J. E., Jr. 635.9
Flower gardening [in Missouri].
Circ. Mo agric. Exp. Stat. **306**, 1946, pp. 16.

CITRUS AND SUB-TROPICALS.

2173. RICHARDS, A. V. 634.3-1.541.11/12
Stock-scion influence in citrus.
Trop. Agriculturist, 1945, **101**: 61-71.
All four varieties of grapefruit (*C. paradisi* Macf.) at Peradeniya—Walters, Marsh Seedless, Triumph, and Foster—made healthy growth on rough lemon (*C. jambhiri* Lush.), an invigorating stock. On sour orange (*C. aurantium* L.) and hybrid sweet orange (*C. sinensis* hybr.) their growth was variable with a tendency for most plants to be stunted and chlorotic. Scion overgrowth was noticeable in many on sour orange, a semi-dwarfing stock. All the varieties failed on pummelo (*C. maxima* Mesr.), Triumph and Foster were the first to become stunted and chlorotic, while Walters, the most invigorating scion, was the last. All four varieties—Walters, Cecily Seedless, Marsh Seedless, and Triumph—at Hingurakgoda showed similar behaviour as at Peradeniya on rough lemon and sour orange. The six varieties of sweet orange—Vavuniya, Bibile, India, Valencia Late, Mediterranean Sweet, and Washington Navel—at Nalanda and Hingurakgoda were compatible with rough lemon, but on sour orange the growth of the imported varieties was variable, many being stunted and chlorotic. The local varieties, especially Vavuniya, made healthy growth, although the plants were comparatively small. All three mandarin varieties (*C. nobilis* var. *deliciosa*) —Nagpur Santra, Emperor, and Beauty of Glen Retreat—at Nalanda were compatible with rough lemon, but on sour orange Nagpur Santra made healthy growth while Beauty of Glen Retreat and to some extent Emperor were failures. [Author's summary.]

2174. MOREIRA, S. 634.3-1.541.11
Cavalos para citros em São Paulo. **(Citrus rootstocks in S. Paulo.)**
Rev. Agric. São Paulo, 1946, **21**: 206-26.
The results are described and tabulated of trials with various citrus rootstocks, using, as the scion varieties, the Baianinha and Pera oranges and Marsh's Seedless grapefruit. The general rootstock recommendations for these three varieties are summarized as follows, the rootstocks being placed in order of preference. (*a*) Baianinha orange—Caipira orange, National rough lemon, sweet lemon. (*b*) Pera orange—Persian lime, Cravo lemon, sweet lemon and Caipiri. (*c*) Marsh's Seedless grapefruit—National rough lemon, Caipira orange, sweet lemon.

2175. MENDEL, K. 634.31: 581.11
Orange leaf transpiration under orchard conditions. Part 2: Soil moisture content decreasing.
Palestine J. Bot. (*R.*), 1945, **5**: 59-85, bibl. 52, being *Bull. agric. Res. Station Rehovot* **37.**
The results of a study on orange leaf transpiration under orchard conditions with an ample supply of soil moisture were published in an earlier paper (*ibidem*, 1938, 2: 171-250; *H.A.*, 9: 971). The present investigation on the same problem, but under conditions of restricted moisture, was carried out in 1937/38 with Shamouti trees on sweet lime and sour orange rootstocks. It was found that the parallelism between transpiration rate and evaporation, characteristic of ample moisture supply (with the exception of the midday hours), ceases as soon as the moisture content of the soil begins to decrease. When the soil suction forces in the main root horizons rise considerably above 3·5 atmospheres, the daily transpiration curve is essentially governed by stomatal movements, the closing of stomata beginning already in the third or even second hour after sunrise. A comparison between Shamouti oranges on sweet lime and sour orange rootstocks showed that under conditions of ample moisture supply trees on sweet lime have a significantly higher transpiration rate. With decreasing soil moisture, trees on sour orange transpire at a higher rate. One of the explanations given to resolve this seeming contradiction is that sour orange roots penetrate the soil to deeper layers than roots of the sweet lime. A plea is made for publishing figures of soil suction forces rather than soil moisture contents in order to obtain comparable results for different soils.

2176. OPPENHEIMER, H. R.
634.31: 581.144.4: 581.192
Leaf analyses of Shamouti oranges. A preliminary report.
Palestine J. Bot. (*R.*), 1945, **5**: 86-95, bibl. 16.
A preliminary survey of the nutritional status of Shamouti orange trees in neglected citrus groves in Palestine by the as yet insufficiently developed method of foliar analysis has rendered the following principal results: (1) The ranges of N, P, K, Ca and Mg are very similar to those found in Valencia oranges in South Africa. (2) Contents of N, P, K and Mg seem to have reached a dangerously low level only in rare cases. (3) Growth responses of the trees to application of fertilizers (supplying them essentially with N) were reflected to a satisfactory degree in the increasing content of N and the decreasing content of P in the leaves. Indications were forthcoming that the supply of P and Mg in some groves is insufficient. On the whole the results obtained so far with foliar analysis in this and similar studies promise to be of practical value in the determination of the nutritional requirements of citrus trees. [Author's summary.]

2177. BARTHOLOMEW, E. T., AND SINCLAIR, W. B.
634.31: 581.192
Factors influencing the volatile oil content of the peel of immature and mature oranges.
Plant Physiol., 1946, **21**: 319-31, bibl. 13, being *Pap. Citrus Exp. Stat., Riverside, Calif.* **538.**
In connexion with their work on the relationship between volatile oil content in the peel of oranges and susceptibility to water spot (see *Calif. Citrogr.*, 1945, 30: 266-7; *H.A.* 15: 1889) the authors carried out further experiments to determine the effect of age and size of fruit, and of environment, on the peel oil content of healthy Valencia and Washington Navel oranges. It was found that so long as the fruit is growing the amount of volatile oil in the peel is directly proportional to the surface area, while afterwards it is controlled by environmental and physiological conditions. The oil content is highest in fruits from the inland district and lowest near the coast. Large fruits yield more oil per surface area, but on a tonnage basis small fruits are

the richer source of oil. The yield of oil from Valencias is much greater than that from Navels.

2178. MALAN, P. F. 634.3-2.19
Spraying citrus trees for mineral deficiencies.
Fmg S. Afr., 1946, **21**: 8, 18.

The following spray formulae are recommended for correcting zinc deficiency of citrus in South Africa, where this malady is not uncommon in certain areas. For acute deficiency—which should never be allowed to occur—10 lb. zinc sulphate (23-25% zinc) plus 5 lb. hydrated lime in 100 gallons of water at the rate of 4-6 gallons per tree. In areas where a zinc deficiency is known to exist the trees should receive a zinc spray regularly, for instance once every two years, the following formula being recommended: 4 lb. of zinc sulphate plus 2 lb. hydrated lime in 100 gallons of water. The treatment may be applied at any time of the year, the quickest results being obtained just before a growth flush. Where scale infestation is severe, spraying should be carried out after fumigation. Normally, the most convenient time for spraying is shortly after picking to save removing the residue from the fruit.

2179. SHIFTAN, S. L. 634.3-2.111
Frost injury to citrus fruits and the conditions favouring its occurrence in Palestine.
Palestine J. Bot. (R.), 1945, **5**: 96-105, bibl. 7.

Determinations have been made of the freezing point of pulp and peel of Shamouti oranges, Eureka lemons and Marsh grapefruits. Osmotic concentrations of the apical portion were found to exceed those of the basal portion in both pulp and peel. Cold waves readily penetrate citrus fruits, and the white portion of the peel possesses no thermo-isolating properties. Undercooling of the fruit often prevents its freezing at temperatures above $-3°$ C., but at approximately $-4°$ ice is formed and the fruit is injured. On calm nights, fruits growing within the leafy tops of orange and grapefruit trees are relatively better protected from frost injury than fruits on the outside of the trees, as temperatures within the crown were found to be about 1° C. higher than outside or above the trees. The rise of temperature per metre above soil level was found to be surprisingly high in the grove and in one case reached $\frac{3}{4}$° C. Some practical conclusions regarding the order in which fruit should be picked after frost nights have been drawn from these results. [Author's summary.]

2180. FAWCETT, H. S. 634.31-2.8
Stubborn disease of citrus, a virosis.
Phytopathology, 1946, **36**: 675-7.

Experimental evidence shows that stubborn disease on navel orange trees is of virus origin. The virus, designated as *Citrivir pertinaciae*, is described.

2181. SCHULTZ, E. F. 634.3-2.4
Algunas observaciones sobre la podredumbre de las raicillas del naranjo agrio injertado. **(Root rot of grafted bitter orange.)**
Bol. Estac. exp. agric. Tucuman, **54**, 1945, 22 pp.

This bulletin is an elaboration of the points raised in Fawcett's paper (see above), but includes also an account of certain rootstock trials carried out, as precautionary measures, with the object of providing grafted citrus trees suitable for replacing those that would succumb should this disease invade Tucuman. The chief conclusions from the rootstock experiments and general observations are: *Citrus sinensis* Osbeck, sweet orange, induces vigorous growth of the scion variety and is particularly suitable for upland soils and those without facilities for irrigation; under such conditions the trees suffer but little from gummosis. Under irrigation the trees on this stock should be planted in mounds 12-15 cm. above the general soil level so that the irrigation water does not remain in contact with the trunks, thus avoiding collar rot; it is resistant to root rot. *C. aurantium* L., the bitter orange, is used in north-west Argentina almost exclusively, because of its resistance to collar rot. In the Argentine Litoral the sweet orange, mandarin and grapefruit on this stock are severely affected by root rot, but not lemon. *Citrus reticulata* var. *austera* Swing., Rangpur, makes good union with commercial varieties of orange, grapefruit, mandarin and lemon, producing early and productive trees; it is specially recommended as a rootstock for temperate varieties, accelerating ripening by 15 to 20 days. It is somewhat more resistant to frost than the bitter orange and up to the present is considered to be resistant to root rot in Brazil. *Poncirus trifoliata* is considered of little value for Tucuman. Trees on it develop too slowly and are not productive enough. The only commercial variety that grows well on it in the Tucuman experiment groves is Ruby Blood. Varieties worked on it acquire a marked resistance to frost and immunity to root rot. *C. limon* (Linn.) Burmann, the rough lemon, is particularly suitable for the light soils of Tucuman, trees on it growing vigorously. It has a disadvantage that the first two or three crops are only of mediocre quality, having thick rinds; later crops improve in quality. Mandarins on it sometimes produce small fruits. It is sensitive to frost and so should not be grown in areas subject to frost. It is rather resistant to collar rot and immune from root rot. *C. paradisi* Macf., grapefruit, can adapt itself to various types of soil, and varieties worked on it develop vigorously, in fertile soil well supplied with humus, and also in light soils. In Tucuman sweet oranges, mandarins, lemons and grapefruit on the grapefruit variety Triumph (a hybrid) and on the common grapefruit (McCarty and Duncan) have developed into vigorous trees, healthy and, up to the present, productive, with fruit of good quality. It is resistant to gummosis and root rot. *C. reticulata*. The mandarins Cleopatra and Oneco are very promising for north-west Argentina. Varieties on them grow well in light soils. They are resistant to gummosis and appear to be resistant also to root rot. *C. aurantifolia* (Christman) Swing. has been used as a rootstock for some years in the Argentine Litoral because of its supposed immunity to root rot. Its behaviour in Tucuman has not been consistent; some varieties grow well on it but the variety Ruby Blood, which is compatible with most varieties, is a complete failure on this rootstock. It is not considered as a variety of promise for Tucuman.

2182. MARCHIONATTO, J. B. 634.31-2.4: 632.651.3
Nota relacionada con la etiología de la " podredumbre de la raicilla " del naranjo. **(The cause of root rot of sweet orange.)**
Rev. argent. Agron., 1946, **13**: 96-100, bibl. 16.

The author criticizes the theories attributing the root rot of sweet orange to the action of a virus and maintains that the evidence available supports his contention that the disease is caused by the nematode *Tylenchulus semipenetrans* Cobb.

2183. DASTUR, J. F. 634.3-2.4
Notes on *Corticium album* Dast. and *C. salmonicolor* B. and Br.
Curr. Sci., 1946, **15**: 192-3.

A fungus occurring on living stems of *Citrus aurantium* and previously described under the name *Corticium album* Dast. is now given the name *Pellicularia alba* Dast.

2184. EBELING, W. 634.3-2.6/7
Problemas relacionados con las pestes que afectan a los citrus y otras plantas subtropicales en Chile. **(The pests of citrus and other sub-tropical plants in Chile.)**
Agric. tec. Chile, 1944, **5**: 197-211.

This article is a translation in Spanish of a report by Dr. Ebeling, of the University of California, on observations made during a 4-weeks tour of the citrus and olive growing areas of Chile. It discusses (1) the citrus areas in Chile, (2) cultivation (the use of nitrogen fertilizers, pruning, pest control), (3) citrus pests, (4) the use of insecticides, (5) the

parasites of pests of citrus and olive, (6) pests and diseases of the olive, (7) avocado, (8) cherimoyas, (9) figs, (10) the second cropping of peaches and late defoliation, and (11) general observations.

2185. EBELING, W. 632.752: 632.951
DDT and rotenone used in oil to control the California red scale.
J. econ. Ent., 1945, **38**: 556-63, bibl. 8.

A method was devised for evaluating the effectiveness of insecticide treatments based on population studies of the red scale at long periods after treatment. A 5% kerosene-DDT spray (4 g. of DDT to 100 ml. of kerosene) left about the same amount of DDT on the leaf surfaces as Gesarol AK-20 used at 10 lb. to 100 gallons of spray (2 lb. of DDT to 100 gallons), yet the former was far more effective in controlling the red scale. Apparently the needle-like crystalline form in which the DDT is deposited by a kerosene spray has greater residual insecticidal value than the form in which it is deposited by the aqueous suspensions used in the experiments. In either the oil or the kerosene sprays, 4 grams of DDT was added to 100 ml. of oil. The 5% kerosene-DDT spray was as good as, or better than, the usual 1·67 or 1·75% regular light medium or heavy medium spray oil treatment. A 5% DDT dust applied twice at 1·5 lb. per application resulted in an increase in red scale population as compared to the untreated check. Derris extractives or cubé root added to regular oil sprays sometimes added to be of the effectiveness of the treatments, sometimes appeared to be of no appreciable advantage, and in one experiment definitely reduced the effectiveness of the treatment, as compared to oil alone. When added to kerosene-DDT sprays, cubé root in nearly all cases reduced the effectiveness of the treatments as compared to kerosene-DDT alone. In areas where citrus red mites and citrus aphids are ordinarily a problem, the DDT caused an increase in the number of these pests. This increase was especially noticeable when no oil of the light medium grade or heavier was used in the spray. No sign of injury to orange or lemon trees attributable to DDT was noticed whether the DDT was dissolved in oil or used in any other manner. [From author's summary.]—California Citrus Experiment Station, Riverside.

2186. LINDGREN, D. L., LADUE, J. P., AND DICKSON, R. C. 632.752
Laboratory studies with rotenone oil in sprays to control the California red scale.
J. econ. Ent., 1945, **38**: 567-72, bibl. 3, being *Pap. Calif. Citrus Exp. Stat.* **532.**

A laboratory method has been devised to make possible rapid and accurate determinations of small differences in the effectiveness of oil sprays against the California red scale, *Aonidiella aurantii* (Mask.). When derris extractives (30% rotenone) were incorporated into a light-medium spray oil, with n-butyl phthalate as mutual solvent, there was a progressive increase in the toxicity of the oil to the red scale as the concentration of the derris extractives was increased from 0 to 0·7%. Ground cubé root (4·3% rotenone; 200-mesh) soaked in straight oil or emulsive oil was about as effective as the derris extractives incorporated into the oil by means of mutual solvents. Mutual solvents which reduced the oil-depositing efficiency of the spray also reduced its insecticidal efficiency. The result of ageing in reducing the effectiveness of the solution was greatest when the extractives were dissolved in n-butyl phthalate, and was only slight when the extractives were dissolved in di-isobutyl ketone; with diamyl phenol practically no deterioration occurred. When the toxic ingredients of cubé root were extracted by soaking the root in light-medium emulsive spray oil, no reduction in the effectiveness of the oil was caused by 6 months of ageing. Twelve hours of soaking of the ground cubé root in the oil appeared to result in complete extraction of the toxic ingredients. [From authors' summary.]

2187. ULLYETT, G. C. 634.3-2.752
Red scale on citrus and its control by natural factors.
Fmg S. Afr. 1946, **21**: 333-7.

A tour of South African citrus growing areas, undertaken by the author, confirmed earlier reports that within recent years red scale has been controlled by natural factors where fumigation had been discontinued by accident or design. This observation was made in widely-separated parts of the country so that environmental conditions cannot be considered responsible. It is obvious that fumigation never gives a chance to red scale parasites and predators to build up a sizeable population, firstly because they are killed off themselves and secondly because their hosts or prey are killed off. His observations led the author to the suggestion that the red scale population should remain unchecked by fumigation, so as to allow its enemies to become established. Within two years the balance would be restored and the pest would be kept under control as efficiently as by chemical means, only very much more cheaply. During the transition period growers must be prepared to accept a total loss of exportable fruit. On larger estates the financial burden can be lightened by turning over individual orchards to natural control as required, while the small growers should seek the help of co-operative societies.

2188. HARDY, E. 634/635(569)
Gardening at the Dead Sea.
Gdnrs' Chron., 1946, **120**: 68-9, 80.

Enthusiasm combined with modern methods have achieved the reclamation of the absolutely sterile soil around the Dead Sea. The dirty sand and calcareous dust containing 17% saline and receiving less than 2 in. rain in some years had never previously been cultivated. Each acre had to absorb 16,000 cubic metres of water, pumped from the Jordan, to become salt-free. Manure is applied by creating carp ponds, the water of which is fertilized for the first two years. In this lowest garden of the world, 1,000 feet below sea level, extraordinarily high yields—28 tons of tomatoes per acre are named—reward the pioneers for their hard labour and ingenuity. Banana cultivation has proved a complete success and other tropical, subtropical and temperate crops are doing well. Beautiful gardens were also established.

2189. GILBERT, S. G., SELL, H. M., AND DROSDOFF, M. 633.85-2.19: 546.56
The effect of copper deficiency on the nitrogen metabolism and oil synthesis of the tung tree.
Plant Physiol., 1946, **21**: 290-303, bibl. 22.

The total nitrogen of deficient leaves was always higher on both milligram and percentage bases than that of normal leaves at the same sampling date. This difference was due in large measure to the abnormally high amount of water insoluble nitrogen found in deficient leaves. The accumulation of this elaborated nitrogen fraction was a characteristic symptom of copper deficiency and indicated the importance of copper in the nitrogen metabolism of the normal plant. It appears likely that in the absence of sufficient copper the plant forms abnormal amounts of complex nitrogen compounds at the expense of the carbohydrate reserves. The greatest effect of the deficiency on the fruit was the failure of the kernel to attain normal size and to synthesize a normal amount of oil. This decrease in oil production is of considerable economic importance on soils low in copper. The composition of the hulls of the tung fruit of normal and deficient trees was in general analogous to that of the leaves. [From authors' summary.]—Field Laboratory for Tung Investigations, Gainsville, Florida.

2190. LE RICHE, F. J. H. 634.421
Guava varieties in South Africa.
Fmg S. Afr., 1946, **21**: 9-17, bibl. 7.

(1) A survey of the available literature on guavas has been discussed. (2) Eight varieties have been described and fu

nalyses of six given. (3) The influence of the stage of peness on ascorbic acid development has been discussed. 4) Results have proved that over-ripeness has no effect on scorbic acid content of sound fruits. [Author's summary.] —Western Province Fruit Research Station, Stellenbosch.

191. WINGARD, S. A., AND BATTEN, E. T. 634.58-1.531.17
Treat seed peanuts for profit.
Bull. Va agric. Exp. Stat. **382,** 1945, pp. 11.
eed treatment was found to increase the emergence of high itality machine-shelled peanuts from 60-65% to 90-92%, nus bringing germination up to the standard of hand-helled untreated seed. Although the stand percentage of and-shelled seed may be raised to 95-98% by treatment, ne laborious method of hand-shelling has ceased to offer ny real advantage over machine-shelling, where good seed s available. Arasan, applied at the rate of 2 oz. per 00 lb. shelled seed, was the most effective of the chemicals ested. The experiments were carried out during the 7-year eriod 1939-45.

192. MEHLICH, A., AND COLWELL, W. E. 634.58-1.811.4
Absorption of calcium by peanuts from kaolin and bentonite at varying levels of calcium.
Soil Sci., 1946, **61**: 369-74.
The uptake of calcium by peanuts was measured as affected y the type of soil colloid, at varying levels of exchangeable Ca. The uptake of Ca increased with increasing Ca levels. The Ca contents of peanut shells produced in the kaolinitic ystems were higher than those in the bentonite media. This difference due to type of colloid was more pronounced t high degrees of Ca saturation and at the higher cation dsorption capacity levels (2·4 m.e. per 100 gm.). The ffect of type of clay on release of Ca was evidenced by the uality of fruit produced. In the kaolinitic type of colloid, ruits of good quality were obtained even at relatively low Ca levels. In the bentonite system larger amounts of Ca, t higher degrees of saturation, were required to produce imilar fruit quality. [From authors' summary.]

193. BLEDSOE, R. W., HARRIS, H. C., AND TISDALE, W. B. 634.58-2.19: 631.811.6
Leafspot of peanut associated with magnesium deficiency.
Plant Physiol., 1946, **21**: 236-40, bibl. 6.
Tests in sand culture indicate that a low level of magnesium vas either directly or indirectly responsible for the suscepti-ility of the peanut to leafspot.—Gainesville, Fla.

2194. POOS, F. W. 634.58-2.73
The control of tobacco thrips on seedling peanuts.
J. econ. Ent., 1945, **38**: 446-8, bibl. 3.
The widespread injury to peanuts commonly called " pouts " should be termed thrips injury if caused by this pest, to avoid confusion with stunting due to other agencies. Until 1944 it had not been possible to control tobacco thrips in peanut seedlings and the damage caused to the crop by this pest could not be assessed. In experiments conducted at Beltsville, during 1944, it was found that control may be practicable under average weather conditions by 2 or 3 applications, at weekly or 10-day intervals, of a DDT dust (2% or less) or a DDT spray (0·66% or less) or DDT aerosol (10% or less). The increase in yield of 35% brought about by treatment may serve as a measure of the losses sustained by peanut growers as a result of tobacco thrips infestation. Attention is drawn also to a concentrated tartar emetic—brown sugar formula, which was very effective in preliminary trials.

2195. GRAYSON, J. M. 632.76: 634.58
Life history and habits of *Strigoderma arboricola*.
J. econ. Ent., 1946, **39**: 163-7, bibl. 6.
The white grub causes minor damage to pods of peanuts.—Virginia Agricultural Experiment Station.

2196. ADSUAR, J. 634.651-2.8
Transmission of papaya bunchy top by a leaf hopper of the genus *Empoasca*.
Science, 1946, **103**: 316.
Evidence has been obtained of the successful transmission of bunchy top of papaya (*Carica papaya* L.) with a leaf hopper of the genus *Empoasca*. Out of 90 healthy trees exposed to leaf hoppers collected on diseased plants, 71 began to show symptoms of bunchy top in about a month and a half. Unexposed controls (5 for every 10 plants exposed) remained healthy.

2197. FENSKE, L. J., AND EFFERSON, J. N. 633.492
a **An economic study of the sweet potato enterprise in the North Louisiana Upland Cotton area in 1943.**
Bull. La agric. Exp. Stat. **395,** pp. 24, bibl. 3.

b FONTAINE, T. D., PONS, W. A., Jr., AND IRVING, G. W., Jr. 634.58: 581.192
Protein-phytic acid relationship in peanuts and cottonseed.
J. biol. Chem., 1946, **164**: 487-507, bibl. 31.

c HARDY, E. 635.9(569)
Gardening in the Holy Land.
Gdnrs' Chron., 1946, **119**: 280-3.

TROPICAL CROPS.

2198. KJAR, N. A. M. 634/635(948.1)
Notes on tropical fruit, vegetable and poultry production in Northern Australia, 1940-1945.
J. Aust. Inst. agric. Sci., 1945, **11**: 157-65.
This article indicates what has been achieved in Northern Australia by Army personnel, only a very small proportion of whom before the war had any specialized knowledge of tropical fruit, vegetables and poultry farming. With the cessation of hostilities plans have been made to close down most of the Army projects and civilian departments will administer the area in the post-war period. With regard to horticultural crops the author reports that the quality of both fruit and vegetables was satisfactory and they compared well with those grown elsewhere in Australia. Most of the normal southern pests and diseases were experienced and routine control measures were necessary. The following notes are taken from the reports on individual crops. *Tomatoes.*—Almost without exception tomato crops were very satisfactory; the 1944 crop averaged over 8 tons per acre of first quality fruit, an equal amount of overripe, inferior and blossom-end rot fruit being left on the bushes. Staking gave best results, but in view of the labour involved unstaked bush planting 6 ft. square had economic advantages. *Cabbages* of excellent quality and up to 28 lb. weight (average 6 lb. per head) were grown with little difficulty. *Lettuce.*—Successful lettuce production was limited in 1943 to certain favoured areas, but later improvement in technique and insistance on use of Imperial 847 indicated that during July, August and September very good quality hearts up to 4 lb. in weight could be obtained on most good quality soil under almost continuous spray irrigation and forced feeding. *Cucumbers.*—All the year round production was obtained, but mildew became difficult to control during " wet " and in mid " dry ". *Pumpkins, marrows, squashes, rock and water melons.*—All the year round production has been achieved with little difficulty, but yields have been light (average 3 tons per acre). Artificial fertilization was needed when bees were not present. *Beans.*—French dwarf types yielded 100-150 bushels per acre in 1942 and 1943 under irrigation in early and mid " dry ". *Dolichos lablab*, snake and sword beans gave very good results at all times, " wet " and in " dry " under irrigation. *Silver Beet* gave very

good results under irrigation. *Chinese Cabbage*, particularly valuable in the tropics owing to its rapid growth and outstanding vitamin content, should be used as a lettuce. It gave good results under irrigation and in good soil. Of miscellaneous crops beetroot was a fair producer under good conditions; limited success was obtained with carrots; shallots gave very good results during the "dry" season under irrigation; radish was easily produced, and other successful crops on a small scale in the "dry" under irrigation were peas, rhubarb, kohlrabi, eggplant, peppers, cress, mustard and sweet potato. Bananas and pineapples did well under suitable conditions. Mangoes yielded heavy crops. Passion fruit vines grew very well but failed to set fruit. Some custard apples made good growth. An area of 5 acres of citrus was successfully established at Adelaide River.

2199. BEIRNAERT, A. 551.566.1: 631.417
La technique culturale sous l'équateur. I. Influence de la culture sur les réserves en humus et en azote des terres équatoriales. **(Cultural practice on the equator. Its effect on reserves of humus and nitrogen.)**
Publ. Inst. nat. Étude agron. Congo belge Sér. tech. **26**, 1941, pp. 86, bibl. 80, Fr. 22.—.
The subject is discussed in 10 chapters under the following headings: Organic decomposition. The nitrogen cycle; transformations of nitrogen in the soil. Nitrogen losses and gains in the soil. The physico-chemical soil conditions. Forest clearance and first cultivation; evolution of organic matter in the soil. Evolution of nitrogen after forest clearing. Evolution of bases after forest clearing. The role of plant cover. The problem of legumes. A programme for the control of soil deterioration. There is only one protective treatment that will save a cultivated soil under tropical conditions, viz. the reduction of its temperature and the addition of lignified organic matter. Even stable manure applied to deteriorated soil cannot restore fertility, it merely acts as a tonic for a little while. To establish at once a complete and effective plant cover is therefore the most urgent requirement in all tropical agriculture. This problem is closely linked with the problem of burning or not burning in forest clearance. The non-burning method was put into operation by I.N.E.A.C. at Yangambi about 5 years before publication of this paper. Forest clearing is carried out in two stages: At first, the undergrowth is cleared and some time later the forest trees. In between the two stages the preparation of the land for planting, including liming, is completed and a leguminous cover is established. Under certain circumstances the following compromise procedure may be preferable: When the first stage has been completed, the piled-up undergrowth is carefully burned on a misty day, but the trees are left.

2200. KAR, B. K. 581.143.26.03(54)
Vernalization of crops cultivated in India.
Nature, 1946, **157**: 811-2, bibl. 12.
Earliness in tropical crops, including jute, is induced by high-temperature vernalization (34°-35° C.) associated with short day lengths. Temperate crops, such as winter wheat, require the opposite treatment under Indian conditions. Data are tabulated.—Bose Research Institute, Calcutta.

2201. JONES, M. A., WHITE, D. G., AND PAGÁN, C. 632.951
Evaluation of some clones of *Derris elliptica*.
Trop. Agriculture, Trin., 1946, **23**: 89-93, bibl. 6.
In this study the criteria upon which the value of *Derris* clones can be based were discussed. The main consideration at present, with certain limitations, should be yield of rotenone per plant or per acre and secondary desiderata should be quality and yield of root. The possibility of ranking clones of a variety of *D. elliptica* was explored with the result that, with the proper experimental design, it was found possible to show significant as well as highly significa differences among clones. It was shown that the lar roots contained the major portion of the rotenone prese in the root system. A discussion is given of the inve relationship between root yield and quality. [Fro authors' summary.]—Federal Experiment Station, Maygu Puerto Rico.

2202. JONES, M. A., AND PAGÁN, C. 632.951
A comparison of three varieties of *Derris elliptica*.
Trop. Agriculture, Trin., 1946, **23**: 76-80, bibl. 8.
The results of this experiment show that the Changi No variety of derris (Rio Piedras clone) was definitely inferi in important respects to both the Sarawak Creeping a St. Croix varieties. Of these superior varieties the Saraw Creeping yielded less root of fairly high rotenone conte while St. Croix yielded a great amount of root of l rotenone content. Correlations between rotenone p centage and two other criteria, colorimetric and to chloroform extractives, are given. The effect of size cuttings on production of root and on rotenone was sho to be negligible. Concerning the number, size and sha of replications required to establish the significance differences in yield of root, rotenone content, and rotenc yield, it was shown that row plots were more efficient th block plots. Single-row plots of 10 plants each, borde with non-experimental plants, appear to be suitable for mu experimental work; 8 replicates should make fairly prec distribution possible. [From authors' summary.]

2203. COOPER, W. C., AND OTHERS. 632.951
Flowering of Peruvian cubé, *Lonchocarpus utilis* A. C. Smith, induced by girdling.
Amer. J. Bot., 1945, **32**: 655-7, bibl. 3.
Girdling the main branches of cubé plants in Peru in M induced flowering in September. This is a practical fi method that should aid genetical and taxonomic studi of this plant.

2204. PELIOWSKI K., B. 633.522-1.531
Influencia de la cantidad de semilla sembrada sobre algunos characteres de la planta y el rendimento en el cañamo. **(The best sowing rate for hemp.)**
Agric. tec. Chile, 1944, **5**: 48-64, bibl. 11.
The object of the work described was to determine the r of sowing hemp seed that produces the best quality stalks and the greatest yield of fibre and seed. The res indicate that the differences between five seeding rates w reference to the technical length of stalk, the yield of b stalk and seed, and the percentage and yield of fibre are significant. Differences between rates of sowing significant only as regards two factors, diameter of stalk a number of internodes. It is considered that under conditions of the experiment it is not advantageous to s more than 90 kilos of hemp seed per hectare in order produce the best quality of stalks and the greatest yield fibre and seed.

2205. BARAHONA Z., J. 633.522
Estudio sobre el estado de madurez mas apropiado para cosechar cañamo (*Cannabis sativa* L.). **(The best time to harvest hemp.)**
Agric. tec. Chile, 1944, **5**: 129-43, bibl. 6.
The following factors were determined for each of different harvest periods, (*a*) stalk yield, "technical length diameter, dry matter, percentage and yield of fibre, (*b*) s yield, weight, germination, oil content, and yield of The data obtained are tabulated. The conclusions reac are as follows: (1) For fibre alone, hemp should be harve not later than when the male plants are beginning to and the females are still green but have already formed s seed. (2) For seed alone the plants should be harve when completely mature. (3) For both fibre and s harvesting should take place when most of the stamin plants and most of the leaves on pistillate plants are dry

2206. ANON. 633.526.1
El abaca en Guatemala. Abaca: *Musa textilis*. **(The manila hemp plant in Guatemala.)**
Rev. agric. Guatemala, 1945, **1** (2nd Ep.): 709-19.
After a brief introduction the rest of this article consists of 21 photographic illustrations showing plantations of *Musa textilis* and the preparation of the fibre for export.

2207. CHANDRARATNA, M. F., AND NANAYAKKARA, K. D. S. S. 633.682
Studies in cassava. I. A classification of races occurring in Ceylon.
Trop. Agriculturist, 1944, **100**: 219-30; 1945, **101**: 3-12, 214-22.
Seventy-five races of cassava (*Manihot utilissima* Pohl) occurring in Ceylon are described in detail and a key to their identification is presented. An appendix is a glossary of Sinhalese and Tamil terms.

2208. BOND, T. E. T. 633.72-1.8: 581.14
Studies in the vegetative growth and anatomy of the tea plant (*Camellia thea* Link.). III. Apical activity and the flush cycle in relation to manuring.
Ann. Bot. Lond., 1946, **10**: 153-8, bibl. 6.
Apical activity and the composition and dimensions of the flush cycle as affected by manuring were studied on 54 unplucked tea bushes from a factorial NPK experiment comprising duplicate treatments of all combinations of the three manures at three different rates of application. The total growth of the bushes during a period of 19 months from pruning was also measured. The effects observed were relatively slight. Both phosphate and potash tended to reduce the rate of apical activity and to cause a decrease in the number of appendages per cycle. The effects of nitrogen were seen chiefly at the middle level of application (at 60 lb. N per acre) which gave the highest growth-weight, the highest rate of apical activity, and the greatest number of leaves in the cycle. Thus, yield and apical activity appear to be positively correlated for differences in the level of nitrogen, negatively correlated for differences in phosphate and potash. [Author's summary.]—Tea Research Institute of Ceylon, St. Coombs, Talawakelle. For parts I and II see *ibidem*, 1942, 6: 607-30 and 1945, 9: 183-216; *H.A.*, 12: 274 and 15: 828.

2209. GADD, C. H., AND LOOS, C. A. 633.72-2.651.3
The problem of nematode control in tea plantations.
Tea Quart., 1946, **18**: 3-11, bibl. 14.
Great optimism does not characterize the authors' attitude in respect of the solution in the near future of the nematode control problem in tea plantations, since none of the control measures used with annual crops is applicable. The problem is discussed from many aspects in relation to the pests *Pratylenchus* (*Anguillulina*) *pratensis* and *Heterodera marioni*. The two encouraging features in the picture are (1) that some tea seedlings show more resistance to nematode attack than others, and hence selection and propagation of such resistant bushes should eventually improve the position, and (2) that elsewhere *P. pratensis* has been found parasitized by species of sporozoa, which indicates that methods of biological control might be developed in future.

2210. LAMB, J. 633.72-1.56
A review of rolling methods in tea manufacture.
Tea Quart., 1946, **18**: 19-29.
The review deals both with traditional methods of tea rolling and with modern attempts to depart from them. E.P. rolling (=eclyptic pressure, the principle employed in the column and cone rolling), which is still in its early experimental stages, is discussed in detail.

2211. THOROLD, C. A. 633.73: 581.192
A note on results from spectrographic analysis of coffee material.
Ann. appl. Biol., 1946, **33**: 177-8.
From analyses of good quality coffee beans, of poor quality beans, and of stem material it was concluded that the Elgon dieback disease cannot be accounted for by a deficiency of any of the major or minor elements as determined spectrographically.

2212. KRUG, C. A. 633.73
Melhoramento do cafeeiro. **(Improving the coffee plant.)**
Bol. Superintend. Serv. Café, S. Paulo, 1945, **20**: 1038-46.
An account of varieties of coffee studied from 1933 to 1944 during research in the sections of genetics, coffee and cytology of the Agricultural Institute, S. Paulo. Four new varieties of *Coffea arabica* are described; other species mentioned are *C. canephora* and *C. dewevrei* var. *excelsa*. Varieties recommended for growing in the state of S. Paulo are Bourbon and Maragogipe. The article closes with a list of 50 papers, up to August 1944, on the work carried out by the Institute on the taxonomy, genetics, cytology and improvement of the coffee plant.

2213. TEIXEIRA MENDES, P. 633.73: 633.88.32.491
Culturas subsidiárias na fazenda de cafe. I. A cultura da mamoneira. **(Subsidiary crops on coffee estates. I. Castor-oil plant.)**
Bol. Superintend. Serv. Café, S. Paulo, 1945, **20**: 1081-9.
The castor oil plant is recommended as a subsidiary crop plant on coffee estates. It should not be interplanted with coffee, however, for it is a gross feeder, and its seeds may get mixed with the coffee beans. Advice is given on choice and preparation of the ground, manuring and rotation, varieties, seed sowing, thinning, pruning, diseases and pests, harvesting, drying and processing.

2214. HEIM, R. 633.73-2.4
Sur une aspergillose du grain de café. **(Aspergillose of coffee beans.)**
C.R. Acad. Agric. Fr., 1946, No. 10, 407-11.
The contamination of coffee beans with an *Aspergillus* is described. The affected beans show here and there discoloured spots; they have a soapy appearance and an irregular outline. The hilum is partly filled with yellowish green hyphae and spores of a form belonging to the *ochraceus* group. It is pointed out that related forms are associated with diseases in man, and attention is called to the possible danger of pleophagous species of *Aspergillus* growing on substances used for human consumption.

2215. CHEESMAN, E. E. 633.74
Results of cacao experiments in 1944-1945.
Trop. Agriculture, 1946, **23**: 63-5.
The experiments concerned are those described in the *10th A.R. on Cacao Research for 1940*, 1941, pp. 3-4; *H.A.*, 11: 1386. Although the results so far accumulated should permit conclusions to be drawn on certain important questions, statistical analyses have not been completed and emphasis in this note is on gross yield data. Still, it may be safely concluded already (1) that pod value depends basically on genetical constitution, but that it is modified by environmental factors, including age, season, number of pods on the tree at one time, and apparently also by rootstock influence; (2) that propagation by cuttings is certainly not inferior to budding, and in some cases possibly better. Finally, the performance of individual clones is discussed. The choice of ICS 1 as the standard clone has proved to be extremely lucky, since it is the most generally satisfactory of all the clones tested and shows a relatively high resistance to witches' broom. ICS 1 is confidently recommended for planting. ICS 6, though also a first-class yielder, appears

to be more susceptible to virus than other clones. ICS 8 equals or even surpasses ICS 1 in yield, but is less resistant to witches' broom. It is suitable for commercial planting where incidence of the disease is not heavy. A similar qualified recommendation may be given in respect of ICS 16, which is suggested for planting in mixture with ICS 1 to ensure adequate pollination. ICS 45, a self-compatible Nicaraguan Criollo cacao, is a high yielder and at the same time more resistant to witches' broom than ICS 1. This clone is promising for planting and breeding. ICS 60, also closely related to the Nicaraguan Criollo group, seems particularly worthy of close observation and commercial trial. It may prove suitable for growing in mixture with ICS 45. ICS 98 is a prolific bearer of small pods, which may be profitable in districts where hardiness is specially desirable.—Imperial College of Tropical Agriculture, Trinidad.

2216. CHEESMAN, E. E. 633.74
The utilization and future of clonal cacao.
Trop. Agriculture, Trin., 1946, **23**: 86-8.

Although cacao research is of recent date only, the results of the last 15 years clearly show that the clonal propagation of selected trees will have much the same revolutionary effect on the production of " fine " cacaos as had a similar practice on rubber production. Growers in Trinidad are advised to replant 4% of their acreage to clonal material annually, in order to renew their plantation within 25 years; but since the existing material is still in the process of rapid improvement, the replacement policy will probably have to go on for a longer period. At the moment, only 7 first class clones are available (see *H.A.*, 16: 2215), but there are several possible sources of further improved planting material: (1) Growers should bring outstanding trees to the notice of the Department of Agriculture. From each approved tree a small progeny will then be raised in a plot convenient for observation. After 5 years the best may be propagated by cuttings in order to make a statistical comparison with standard clones; (2) introduction from elsewhere, clones of Amazon cacao in Trinidad being a precedent; (3) planned breeding. By the time the testing of existing ICS clones is finished there should be available the first of a new series selected from new hybrid populations. It seems likely that in the more distant future the industry will return from clones to seedlings raised from controlled crosses, but this stage will hardly be reached in less than 50 years from now. Discussing the problem of mixed plantings the author suggests that compatibility must not be rated too highly in the valuation of clones. In any case, it is undesirable for planters to confine themselves to one clone only, at least at the present stage.

2217. RINGOET, A., CLAESSENS, J., AND HACQUART, A. 633.74(675)
Note sur la culture du cacaoyer et son avenir au Congo Belge. Appendice: Projet de culture mixte cacaoyers-*Hevea*. **(Cacao growing and its future in the Belgian Congo. With appendix: Mixed cacao-*Hevea* cultivation.)**
Publ. Inst. nat. Étude agron. Congo belge Sér. tech. **28**, 1944, pp. 82, bibl. 12, Fr. 36—.

Cacao cultivation in the Belgian Congo has not yet reached a stage where hard and fast rules can be laid down. In this publication, which is prefaced by the Directeur Général of I.N.E.A.C., Claessens, the author, Ringoet, develops his ideas as a basis for discussion among experts and as a tentative guide for growers. He is conscious of the fact that many points may require correction as experimental results become available. An examination of the world cacao situation leads the author to the conclusion that an expansion of the industry by perhaps 2-3% may be expected. Whether European planters in the Belgian Congo will be able to compete on the world market is not certain. Possibly, a gradual transfer of the industry to Africans must be envisaged. The practical aspects of cacao growing discussed include climate, soil, shade, spacing, selection of pla material, fermentation, establishment of a plantation (la preparation, management of a young plantation), manag ment of a plantation in full production. In the append a plan is worked out by Hacquart for establishing a mix cacao-*Hevea* plantation in two stages, the layout of whi is mapped. *Hevea* acts as a shade tree for cacao, and the is no root competition, as the two plants are deep a shallow rooters respectively. In the first stage 5 grafted and 1,000 seedling *Hevea* trees are planted p hectare. After 4 years half of the seedling rubber trees a tapped to exhaustion and scrapped, and 1,000 cacao tre are planted per hectare. The remaining 500 seedli *Hevea* trees are removed after tapping as shade becom too intense.

2218. WEST AFRICAN CACAO RESEARCH INSTITUTE. 633.74-2.8
Swollen shoot of cacao. How to recognise and control.
Mem. Dep. Agric. Gold Coast, 1945, pp. 20.

The memorandum contains 14 photographic illustratio of swollen shoot disease symptoms and 3 maps of outbre areas. An amendment slip warns readers that the reco mendations given in the pamphlet have been made obsol in several respects by work over the past year.

2219. LANGHAM, D. G., AND CORTES, R. 633.853.74: 575
Herencia del numero de glandulas folaires en el ajonjoli (*Sesamum indicum* L.). **(The number of leaf glands an inherited character in sesame.)**
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **7**, 1945, 6 pp.

The sesame plant bears glands on its leaves, shoots, flow and capsules. The number of glands per plant—it var considerably among the different varieties—appears to b quantitative, hereditary character.

2220. LANGHAM, D. G. 633.853.74
El caracter glabro en el ajonjoli (*Sesamum indicum* L.). **(A glabrous type of sesame.)**
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **8**, 1945, 5 pp.

A glabrous type of sesame is described. This character i simple recessive. Because of the simplicity of its inherita and of the ease of classification, the character *glabrous* very useful in genetical investigations.

2221. LANGHAM, D. G. 633.853.74: 575
Ajonjoli (*Sesamum indicum* L.) sin glandulas en el haz de la hoja. **(Sesame without glands on the dorsal surface of the leaf.)**
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **9**, 1945, 6 pp.

The absence of glands on the dorsal surface of the leaves sesame has been observed in the varieties Jaffa and Ve zuela and White of India. This character is recessive some hybrids and dominant in others. In this study absence of glands on the dorsal surface of the leaves been always associated with tetracarpellary fruits, and presence of glands with bicarpellary fruits.

2222. LANGHAM, D. G. 633.853.74: 575
El modo de herencia del numero de capsulas por axila en el ajonjoli (*Sesamum indicum* L.). **(The inheritance of seed-pod number in sesame.)**
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **10**, 1945, 7 pp.

In the varieties tested the character of one capsule per (T) is dominant to the character three capsules per axil and segregates in the ratio 3 to 1 in the second generati The extreme variability in the degree of expression of character *t* requires careful selection for this character segregant cultivations. A variety from China and

rom India were crossed with a variety Selection No. 5 and ll the hybrid plants of the first and second generations ere *t*, showing that the genes for this character were llelomorphic in all three varieties.

223. LANGHAM, D. G. 633.853.74: 575
Plantas de ajonjoli (*Sesamum indicum* L.) que se tornan amarillas antes de la madurez. (**Sesame plants which turn yellow before ripening.**)
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **11**, 1945, 5 pp.

Most of the varieties of sesame studied change from green o brown as they approach maturity, but two varieties, one rom China the other from India, turn yellow instead of rown. The yellow phase is inherited as a simple recessive haracter.

224. LANGHAM, D. G. 633.853.74: 575
Hoja fruncida, un caracter indeseable en el ajonjoli (*Sesamum indicum* L.). (**An undesirable wrinkle leaf character in sesame.**)
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **12**, 1945, 6 pp.

A wrinkling of sesame leaves caused by the formation of ecrotic areas in the ventral surface of the leaves is described. his character is inherited as a simple Mendelian character. uch undesirable recessive characters make selection lower and more difficult.

225. LANGHAM, D. G., AND RODRIGUEZ, M. 633.853.74-2.753
Resistencia al afido (*Myzus persica* Sulz) en el ajonjoli (*Sesamum indicum* L.). (**Aphid resistance in sesame.**)
Circ. Dep. Gen. Inst. exp. Agric., Venezuela, **13**, 1945, 7 pp.

he aphid *Myzus persicae* is an important pest in sesame lantations. Certain types of sesame show natural resistance o it and for this reason are being used for rearing new esistant varieties. Meanwhile the treatment suggested for ne control of the pest is spraying with 1% solution of icotine sulphate with soap.

226. JAYAWEERA, D. M. A. 633.88(548)
Drug plants (indigenous and exotic) that can be grown in Ceylon. Part I.
Trop. Agriculturist, 1945, **101**: 130-5, bibl. 12.

Brief descriptions are given of plants growing in Ceylon rom which useful drugs can be obtained, including *Artemisia bsinthium* L., *Anogeissus latifolia* Wall., *Acalypha indica* L., *Adhatoda vasica* Nees, *Allium sativum* L., *Aloe vera* var. *ttoralis*, *Alstonia scholaris* R.Br., *Alkanna tinctoria* T., *Areca catechu* L. and *Aristolochia indica* L.

227. TORUÑO, J. A. 633.912
El cultivo del hule (*Hevea brasiliensis*) por pequeños terratenientes en la republica de Guatemala. (**Rubber cultivation for the small holder in Guatemala.**)
Rev. agric. Guatemala, 1945, **1** (2nd Ep.): 758-69.

his article begins by referring to a co-operative programme f the Ministry of Agriculture of Guatemala and the epartment of Agriculture of U.S.A. for the establishment f hevea plantations in Guatemala. The government f Guatemala is attempting to amplify the programme by cluding numerous small estates which will need govern- ent support, and the article has been written to enable nallholders to understand what the scheme involves. gives a general account of the cultivation of hevea from he preparation of the seedbeds to the extraction of the latex nd treatment of the rubber for market. It concludes with n illustrations from photographs taken in hevea planta- ons.

2228. FERRAND, M. 633.912-1.56
Observations sur les variations de la concentration du latex *in situ* par la microméthode de la goutte de latex. (**Observations on variations in concentration of latex *in situ* by the micro-method.**)
Publ. Inst. nat. Étude agron. Congo belge Sér. sci. **22**, 1941, pp. 33, bibl. 6, Fr. 12.—.

The author developed what he calls the latex drop micro-method which enabled him to study a large number of *Hevea* latex samples *in situ* and thus to follow the variations of latex concentration under a variety of conditions. A few drops of latex collected by means of a scalpel are put onto a hollow-ground slide and are covered with an ordinary slide, evaporation being prevented by means of two elastics. In the laboratory the slides are weighed and dried in an incubator for 24 hours at 45°-50° C. Theoretically, variations in latex concentration may be due to variations either in water content or in dry matter content. Observations and experiments ruled out the first possibility. The water balance of the tree was shown to have no influence on latex concentration. On the other hand, a close relationship was shown to exist between latex concentration and factors generally affecting physiological processes. Night, cloudy weather, cold mists, etc., tended to increase the concentration, while high temperatures and strong light had the opposite effect. From these observations the conclusion is drawn that the conception of latex materials as metabolic waste products must be revised. On the contrary, the latex seems to be a reservoir of valuable materials, which is drawn upon when photosynthetic activity is high. The micro-method of studying latex concentration *in situ* may also furnish a clue to differences in brown bast susceptibility between clones and at different ages of the same tree. Brown bast seems to be favoured by bark that absorbs comparatively much water from the adjoining tissues and consequently causes the latex to be more dilute. This is the case with young trees towards the end of the tapping period and with certain clones. The latex concentration percentage obtained by ordinary tapping compared with that obtained by the *in situ* test provides a measure of bark behaviour. In the case of the clone Avros 49, for instance, the concentration of tapped latex was 70% of the concentration of *in situ* latex, as against 59% in the case of the clone Tjirandji I. Avros 49 has a far higher resistance to brown bast than Tjirandji I. This relationship between latex concentration and brown bast susceptibility may prove important in selection work.

2229. RANDS, R. D. 633.912-2.4
Progress on tropical American rubber planting through disease control.
Abstr. in *Phytopathology*, 1946, **36**: 688.

Since 1940 the U.S. Department of Agriculture has conducted co-operative research and furnished technical guidance to 13 tropical American Republics interested in rubber planting. Control of leaf blight (*Dothidella ulei*) by spraying and by crown budding with resistant varieties has removed the main obstacle to establishing tropical American plantations. Breeding has furnished thousands of first and second generation hybrids, some of which have given indication of combining superior yield with blight resistance.

2230. LANGFORD, M. H. 633.912-2.4
Regional differences in resistance of *Hevea* selections to South American leaf blight.
Abstr. in *Phytopathology*, 1946, **36**: 686.

Hevea rubber seedlings and clones assembled from many parts of the world have been exposed to South American leaf blight (*Dothidella ulei*) in widely scattered tropical American nurseries during the past five years. Some clones have proved highly susceptible to practically all regional populations of the fungus, others have been susceptible to certain variants only, and still others—now

recommended for commercial use—have been highly resistant in all areas.

2231. PILLONI, S. 634.1/7
La fruticultura. **(Fruit growing.)**
Rev. agric. Guatemala, 1945, **1** (2nd Ep.): 727-38.
A popular general account of the factors and operations involved in successful fruit growing, including reproduction by seed and by vegetative propagation, budding and grafting, transplanting, pruning and shaping the trees (spring and summer pruning), manuring and meteorology, with a brief reference to pests and diseases and their control.

2232. GRUNBERG, P. 634.11
El manzano. **(The apple.)**
Rev. agric. Guatemala, 1945, **1** (2nd Ep.): 738-56.
A popular account of the cultivation of the apple. Its importance as a crop plant is set out, i.e. its longevity, hardiness, and ease of sale, storage and transport of the fruit. Notes are given on the various operations involved—preparation of the soil, rootstocks (paradise, doucin, quince, seedling stocks), budding and grafting, wind-breaks (poplar and eucalyptus mostly used [in Guatemala] but good results are also given by cypress, pine, casuarina, etc.), manuring, planting, choice of varieties, pruning, spraying, thinning the fruit, harvesting the crop.

2233. GUNARATNAM, S. C. 634.441(54.8)
The cultivation of the mango in the dry zone of Ceylon.
Trop. Agriculturist, 1945, **101**: 227-31.
Great interest is being taken in the cultivation of the mango in Ceylon, and an increasing number of mango grafts of good variety are planted yearly. The tree has the greatest possibility of development in the dry zone of the island where it can be grown with little or no irrigation. A dry climate is most suited to the mango, especially during the time of flowering, for rains affect the setting of fruits. The regions possessing the ideal conditions are mentioned, and the total rainfall and amount of rain which falls during the mango-bearing season are quoted for a number of places in those regions. The selection of site becomes important when the mango is to be planted on an orchard scale. It should be on level ground, near a railway station connected by a good road, and should be away from jungles where monkeys abound. Water should be easily available for irrigating young trees. Sites with rocky subsoil should be avoided. Hints on the preparation of the land, planting and manuring are given.

2234. REECE, P. C., FURR, J. R., AND COOPER, W. C. 634.441: 581.145.1
The inhibiting effect of the terminal bud on flower formation in the axillary buds of the Haden mango.
Amer. J. Bot., 1946, **33**: 209-10.
Inflorescences in the mango develop under normal conditions only from terminal buds, but, if the terminal buds are removed during the flowering period, inflorescences are produced by axillary buds (which would normally remain dormant) in the distal region of the shoot. Experiments on girdled decapitated branches indicate that, when leaves are present above the girdle, floral induction takes place in the axillary buds in a period between 1 and 4 days after decapitation and that floral differentiation rapidly follows.

2235. WARDLAW, C. W. 634.6-2.48
A wilt disease of the oil palm.
Nature, 1946, **158**: 56.
In the Belgian Congo, the author came across a hitherto undescribed wilt disease of the oil palm, *Elaeis guineensis*, which has already caused considerable destruction of 4-20 year old palms in widely separated areas. The lower leaves of diseased plants first show characteristic wilting, later they break near the base and hang down in a cluster around the trunk. Younger leaves are successively affected until the plant dies. Microscopic preparations revealed the presence of *Fusarium* hyphae in necrotic wood vess associated with gum exudations which block the vesse In some respects, the disease shows close resemblance wilt of bananas caused by *Fusarium oxysporum cuben* Further study of the trouble is urgently recommende There are two photographic illustrations.

2236. LEACH, R. 634.61-2.8
The unknown disease of the coconut palm in Jamaica.
Trop. Agriculture, Trin., 1946, **23**: 50-60, bibl. 6.
The author's investigations of the " unknown disease of t coconut in Jamaica "—as the author suggests this serio malady should be termed for the time being—have carri the study a stage further, thereby rendering the proble even more enigmatic. After two years' work with you seedling palms in Trinidad he formulated certain conclusio which, however, became doubtful again in the light of la observations made in Haiti and elaborated in a postscri What remains valid of the experimental results is t evidence that the unknown disease of coconuts in Jamai is not identical with bronze leaf wilt in Trinidad. T conclusion is based on a detailed description of the sympto of both diseases and on the absence of any relationsh between drought and incidence of the unknown disea On the contrary, palms were found to be more susceptib when they are growing actively. In Haiti, the disease h been present for about 60 years in the northern plain arou Cap Haitien without causing more than moderate damag In 1943, it suddenly appeared in a most virulent form Gonaives about 40 miles away, killing practically all of t about 8,000 bearing coconut palms in the district with two years. And associated with this outbreak there h been an equally sudden and serious mortality of date pal at Gonaives; even a few royal palms have been killed. this area, where the plants are affected long before they rea the bearing stage, the soil is highly alkaline and in parts t water table is as high as 18 in. from the surface. Howev the disease is not confined to alkaline soils, for near Lim it occurs on free draining and slightly acid soils derived fr an igneous rock formation. Possible causes of the disea are discussed and it is suggested that further studies w both coconut and date palm seedlings should be carried o at Gonaives.

2237. CAMARGO, F. C. 634.774
Vida e utilidade das bromeliáceas. **(The *Bromeliaceae* and their uses.)**
Bol. Tec. Inst. agron. Norte, Brazil, **1**, 1943, 31 pp., bibl. 28.
The author describes the use of several wild species *Bromeliaceae* as fibre-producing plants for domestic purpo and recommends plant breeding to improve and make th suitable for developing a future fibre industry. El species and varieties are described and their habitat giv Some of the old descriptions of floral characters are deem to be of secondary importance and it is considered necess to redescribe the genera *Ananas* and *Pseudananas*. paper is illustrated by 2 plates (of 40 drawings) and photographs.

2238. SIDERIS, C. P., AND YOUNG, H. Y. 634.774-1.83: 581.192
Effects of potassium on the nitrogenous constituents of *Ananas comosus* (L.) Merr.
Plant Physiol., 1946, **21**: 218-32, bibl. 32, being *Tech. Pap. Pineapple Res. Inst. Univ. Hawaii* **162.**
High-potassium cultures (205 mg. per l.) compared w low-potassium cultures (4 mg. per l.), supplied with ec amounts of nitrogen either as nitrate or ammonium, modi the relative amounts of different nitrogenous fractions in tissues of *A. comosus*. The data indicate that the phy logical function of potassium in the conversion of solu organic nitrogen fractions to protein nitrogen in hi potassium cultures is more noticeable in the stem than in

highly differentiated tissues of fully expanded leaves. In the leaves protein-N was higher in the low-potassium than high-potassium cultures. The higher content of protein-N in the stems of the high-potassium than low-potassium cultures is attributed to the conditions in the peripheral and apical regions of the stem which, composed mostly of meristematic tissues and possessing potential growth activity, require greater quantities of proteins for the regeneration of protoplasm than similar tissues of the low-potassium cultures which lack equally great growth potentialities. [From authors' summary.]

2239. SIDERIS, C. P., AND YOUNG, H. Y. 634.774-1.83: 581.192
Effects of nitrogen on growth and ash constituents of *Ananas comosus* (L.) Merr.
Plant Physiol., 1946, **21**: 247-70, bibl. 36, being *Tech. Pap. Pineapple Res. Inst., Univ. Hawaii*, **164.**

A. comosus grown in solution cultures supplied with 140·0 mg. or 2·8 mg. of nitrogen per liter either as nitrate or ammonium produced, after one year's growth, greater weights in the high- than low-nitrogen cultures. Nitrogen absorption from nutrient solutions was approximately five times greater for the high-nitrogen (140·0 mg.) than low-nitrogen (2·8 mg.) cultures in both series. Total ash content per plant was higher in the high-nitrogen cultures of the nitrate series and in the low-nitrogen cultures of the ammonium series than in the competing cultures. Potassium values per plant were approximately the same for the high-nitrogen and low-nitrogen cultures in the nitrate series, but in the ammonium series they were approximately 92·0% greater for the low-nitrogen cultures. Calcium values per plant were greater for the high- than low-nitrogen cultures in the nitrate series. In the ammonium series calcium values for the high-nitrogen cultures were approximately two-thirds as great as in the low-nitrogen cultures. Magnesium absorption per plant from nutrient solutions was approximately the same for the high- and low-nitrogen cultures in the nitrate series, but in the ammonium series it was 1·475 times as great for the low- as for the high-nitrogen cultures. Phosphorus content per plant was 1·81 and 1·72 times greater for the high- than low-nitrogen cultures in the nitrate and ammonium series, respectively. Iron content per plant was greater for the cultures in the nitrate than ammonium series. [From authors' summary.]

240. OSBURN, M. R. 634.774-2.752
Methyl bromide for control of the pineapple mealy bug.
J. econ. Ent., 1945, **38**: 610.

The pineapple mealy bug, *Pseudococcus brevipes*, which is associated with pineapple wilt, is the most important insect pest of pineapple in Florida. Neither dipping infested plants in oil emulsion before setting them nor HCN fumigation of the suckers and slips prevented spread of infestation by propagation. The data obtained in preliminary tests, however, indicate that methyl bromide applied at the rate of 1 lb. per 1,000 cubic feet for 2 hours at 79°-88° F. eliminates the pineapple mealy bug without injury to the plants. Under the same conditions 2 lb. of the chemical caused 100% mortality of the pineapple mite, *Stigmaeus floridanus*. —Subtropical Fruit Insects Laboratory, St. Lucie County, Fla.

2241. FENNELL, J. L. 635.64: 551.566.1
El "Tomate Turrialba". Una nueva variedad para tierras calidas. **(Turrialba, a new variety of tomato for the tropics.)**
Rev. Inst. Def. Café Costa Rica, 1946, **16**: 443-5.

Records the raising of a new variety of tomato at the agricultural institute at Turrialba, in Costa Rica, suitable for cultivation in tropical countries. It was obtained from a cross between a wild type of *Lycopersicon esculentum cereciforme* and Cuban Marglobe. The fruits measure from 76 to 89 millimetres in diameter; they are semi-globular, have a firm pulp, red throughout, and a rather smooth skin [see also *H.A.*, 16:1140].

2242. ANDRÉS, J. M., AND SAURA, F. 633.77: 575.17
a Los cromosomas de la yerba mate y otras especies del genero "Ilex". **(Chromosomes in yerba maté and other species of *Ilex*.)**
Publ. Inst. Genet. Buenos Aires, 1945, **2**: 13: 163-8.

b DODDS, K. S., AND SIMMONDS, N. W. 634.771-1.523
Genetical and cytological studies of *Musa*. VIII. The formation of polyploid spores.
J. Genet., 1946, **47**: 223-41, bibl. 15.

c LIVENS, J. 631.4(675)
L'étude du sol et sa nécessité au Congo belge. **(A study of the soil and its requirements in the Belgian Congo.)**
Publ. Inst. nat. Étude agron. Congo belge Sér. tech. **27**, 1943, pp. 50, bibl. 19, Fr. 16.—.

d MARTIN, W. E., AND GANDARA, J. A. 633.885.1
Alkaloid content of Ecuadoran and other American *Cinchona* barks.
Bot. Gaz., 1945, **107**: 184-99, bibl. 7.

STORAGE.*

243. BATE-SMITH, E. C., AND OTHERS. 664.8.037
Food preservation, with special reference to the applications of refrigeration.
Final Rep. Brit. Intell. Object. Sub-cttee **275,** item No. 22, H.M.S.O., London, 1946 (?), pp. 103+28 figs., 13s. 6d.

This is a report of a visit to German food preservation plants, carried out in August and September 1945. Among the more striking new developments lying within the sphere of interest of *Horticultural Abstracts* particular attention is drawn to the concentration of fruit juices by freezing.

244. VAN HIELE, T. 664.85
De luchtcirculatie in een luchtgekoelde fruitbewaarplaats. **(The circulation of air in air-cooled fruit storage.)**
Tuinbouw, 1946, No. 5, pp. 16-19.

A distinction is drawn between air-cooled and cold storage for fruit, the latter requiring machinery, the former brought about by making use of outside air which is colder than that of the storehouse. The conditions for successful ventilation are discussed, and air-cooled storage buildings are illustrated.

2245. KESSLER, H. 664.85.11: 583.4
Welche Möglichkeiten bietet die Verwendung von Moos in Obstkellern? **(Does moss improve storage conditions of apples stored in cellars?)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 342-7.

While in eastern Switzerland apple storage cellars are, as a rule, too damp, the relative moisture content of cellars in western Switzerland is usually too low. As an engineer in the canton of Wallis found, the latter evil can be remedied by driving an air current over a moist layer of moss. This method is workable with all kinds of ventilation systems. By many, an air-clarifying action is attributed to moss. Careful tests, in which melon seedlings were used, showed that it does not absorb ethylene, but experiences in vegetable and cheese storage make it appear likely that moss has the faculty of absorbing certain odours. This will be investigated and it will be examined whether the loss of heat

* See also 1830, 1831, 1832.

involved in the evaporation of water from the moss will make any appreciable contribution to lowering the temperature of the storage cellar.—Wädenswil Research Station.

2246. BORGSTRÖM, G. 664.85.11
Hållbarhet hos äpplen med särskild hänsyn till SPF:s lagrinstävling. (**The keeping quality of apples with special reference to the storage competition of the Swedish Pomological Society.**) *Sver. pomol. Fören. Årsskr.*, 1945, **46**: 5-34, bibl. 88.

The Swedish apple storage competition [see *Fruktodlaren*, 1945, No. 1, pp. 8-10; *H.A.*, 15: 1301], initiated in autumn 1944, was undertaken with a three-fold aim in view: (1) To determine the limits of commercial apple storage under Swedish conditions, (2) to collect scientific data on the cultivation and storage practices which in Sweden make for good keeping quality, and (3) to work out an evaluation of stored apples based on factual properties. The tables presented include data on the incidence in stored Cox Pomona, Ribston Filippa and Cox's Orange of storage scab, bitter (*Gloeosporium*) rot, soft scald, lenticel spotting and cold injury, the widespread bitter rot incidence being the most remarkable observation made. The main part of this paper, read at a meeting of the Swedish Pomological Society in Stockholm in 1945, is devoted to a survey of the literature on apple storage.

2247. VAN HIELE, T. 634.11-1.564
Over den invloed van de verpakking op de bewaarbaarheid van appelen, 1943/1944. (**Packing in relation to the keeping qualities of apples.**) *Meded. Direct. Tuinb.*, 1946, pp. 543-57.

An investigation is described on the keeping qualities of apples, when packed by a method practised in the neighbourhood of Bodenmeer, Holland. In this method the apples are packed in crates in which there is first placed a layer of paper, then 2 cm. of sun-dried turf litter and on this a layer of apples with their stalks upward, then alternate layers of turf and apples. The investigation consisted of a comparison of four methods of packing: *a*, Control—in the usual way. *b*, The Bodenmeer method, air-dried turf litter. *c*, Bodenmeer method, artificially dried turf litter. *d*, Fruit wrapped in oiled paper. The data obtained (on loss, sound fruit, rot and scald) with different varieties are tabulated, and show no advantage in the turf method. The control and wrapped apples had generally a better appearance than those in turf. Wrapping in oiled paper gave good results with Bramley's Seedling, Notarisappel and Jonathan, as was already known for the first two varieties. With Allington Pippin there is a risk of increasing scald by using oiled paper.

2248. FERNAND, M. 664.85.037
L'entreposage des pommes. (**Apple storage.**) Reprinted from *Rev. d'Oka*, 1945, pp. 44, bibl. 51.

An introduction to all apple storage problems, including gas storage, fruit manipulation and storage troubles for apple growers of the Quebec area, written by the apple expert of the Institut Agricole d'Oka, Quebec, Canada.

2249. HALL, E. G.
664.85.036.5: 664.85.25 + 664.85.13
A note on the storage of peaches and pears for canning.
Food Pres. Quart. Aust., 1945, **5**: 44-8.

In New South Wales and Victoria it is generally necessary to hold considerable quantities of fruit in cool storage prior to canning. Preliminary storage trials with peaches and William pears from the Murrumbidgee Irrigation Area were therefore carried out at the Food Preservation Laboratories, Homebush, in order to supply the industry with more information on this phase of their work. With peaches, the "canning" and "off canning" stages of maturity were used in the trials—the fruit in the "off canning" stage having been picked earlier. Pears were harvested when still quite green. As the result of these experiments it is tentatively recommended that both fruits should be held at a storage temperature of 30° F. Pears should keep satisfactorily for canning for 10 weeks, Golden Queen peaches for 3 weeks and Phillips Cling peaches for 4 weeks. Peaches picked at the canning stage sometimes did not keep quite so long as those picked less mature, but yielded a better quality product. Additional observations suggested that both peaches and pears canned in a riper state than commercially usual are of superior palatability though of poorer appearance.

2250. MILLER, E. V. 664.85.3
Physiology of citrus fruits in storage.
Bot. Rev., 1946, **12**: 393-423, bibl. 75.

Recommended temperatures for storage are: Grapefruit 45° to 55° F. in regions where stem-end decay is not a factor but 32° where liability to this decay may shorten the storage life; oranges, 34° to 38°; lemons, 55° to 58°; and limes 45° to 48° F. Thus, under proper conditions oranges may be stored for 8 to 10 weeks, grapefruit and limes 6 to 8 weeks and lemons for 1 to 4 months without any significant loss in nutritional value. Too long storage at certain temperatures may produce physiological disorders such as aging brown stain or scald, pitting, watery breakdown, albedo browning, membranous stain, peteca and red blotch. Some of the factors that have been reported to predispose citrus fruits to these low-temperature injuries are a high percentage of potash in the fertilizer, a relative high content of moisture and of organic matter in the soil, the susceptibility of specific varieties, harvesting fruit after relatively high mean temperatures, storing fruit from the outside branches of the trees, fruit that is physiologically immature, processing in the packing house and low relative humidity in the storage rooms. Prolonged storage of citrus fruits in relatively high percentages of carbon dioxide has usually resulted in no injury or in a deleterious effect on flavour. Investigators reporting success with carbon dioxide storage of citrus fruits have employed moderate percentages of the gas (10% to 15%). Under certain circumstances ethylene gas is employed commercially for colouring or degreening citrus fruits. The treatment does not measurably affect the solids, acids and vitamin C in the juice. In recent years citrus fruits, like other fruits, have been shown to evolve ethylene as one of the products of normal metabolism, and the evolution of this gas is more rapid in decaying fruit. The peculiar physiological effects of ethylene on stored fruits, vegetables, flowers, etc., has added to the problems of cold storage and indicates that a knowledge of the physiology of fruits and vegetables is essential to the successful storage of these products. [From author's summary.]

2251. BIALE, J. B. 664.85.653
Effect of oxygen concentration on respiration of the Fuerte avocado fruit.
Amer. J. Bot., 1946, **33**: 363-73.

The effects of oxygen on CO_2 evolution by Fuerte avocados were studied in the range of 0 to 99·4% O_2 at 15° C. 10°, 7·5° and 5° C. the response to 2·5, 5·0 and 10·0 oxygen was compared with the behaviour in air. Apparatus for preparing the gas mixtures is described, as is the effect of different rates of flow. When the oxygen concentration is reduced to values below that of air, the rate of CO_2 evolution is markedly affected, with the climacteric peak delayed and suppressed in magnitude. At oxygen tensions higher than air no significant differences occurred as compared with the controls. Under anaerobic conditions the rate of CO_2 production is markedly inhibited with the climacteric rise completely lacking. When the oxygen concentration affected the respiratory course, there was also a pronounced influence on fruit softening. At 2·5% it took approximately twice as long for the fruit to soften in air. The rate of oxygen absorption by the fruit was stud-

at 15° C. under 2·5, 5·0 and 10·0% O_2 and in air. It was observed to follow closely the rate of CO_2 production with some tendency for a higher respiratory quotient at low oxygen tension. The total amount of CO_2 given off by the fruit during the period ending with the climacteric peak was found to be approximately constant for the several modified atmospheres at 15° C. The effects of oxygen tension on respiration were markedly modified by temperature. Differences in CO_2 evolution of the fruit due to the several treatments were most pronounced at 15° C. and least at 5° C.; at 10° C. and 7·5° C. the respiration rates of the avocados were less affected by oxygen than at 15° C., but considerably more than at 5° C. Fruit softening was found to be closely related to the respiration trends. [Author's summary.]

2252. Croxall, H. E. 664.84.25
Some factors influencing loss of onion bulbs during storage.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 143-7, bibl. 1.

The author confirmed the findings of Wallace and Hickman (*Ann. appl. Biol.*, 32: 200-5; *H.A.*, 16: 897) that early lifting before the tops had died down resulted in reduced losses in store. Onions exposed to the weather deteriorated more rapidly after 12 February than those stored in a greenhouse. Treatment of the bulbs with sulphur, a dust containing 50% tetramethylthiuramdisulphide or with a proprietary substance containing trichlornitrobenzene did not affect subsequent loss in store.

2253. Rakitin, J. V. 631.547.6: 581.192
The effect of ethylene on the activity of carboxylase in ripening fruit. [Russian.]
Biohimija (Biochemistry), 1946, **2**: 1: 1-6.

The content of carboxylase and cocarboxylase increases in fruits as they ripen. When the process of ripening is accelerated by ethylene treatment the rate of carboxylase formation is also increased.

2254. Sinclair, W. B., and Lindgren, D. L. 634.63-2.944
Ridges and sectors induced in olive fruits by fumigation with hydrocyanic acid.
Plant Physiol., 1946, **21**: 369-70, bibl. 1.

In an earlier paper (*ibidem*, 1943, 18: 99-106; *H.A.*, 13: 560) the authors reported the induction of ridges and sectors in citrus fruits as the result of HCN fumigation. A similar phenomenon has now been observed to occur in olive fruits and it is suggested that these malformations are associated with a general physiological effect of HCN.—Citrus Experiment Station, Riverside.

2255. Balock, J. W., and Starr, D. F. 632.77: 632.944
Adsorption of methyl bromide and its residual effect on fruitfly mortality.
J. econ. Ent., 1945, **38**: 481-3, bibl. 3.

Fumigation studies conducted in Mexico City with methyl bromide on immature stages of the Mexican fruitfly, *Anastrepha ludens*, in mangoes showed that at the longer periods of exposure mortality ran lower than was calculated. It was found that the wooden containers adsorbed about 36% of the gas and the black paint covering the inside of the drum 20%. With the paint removed the steel lining of the fumigation chamber adsorbed only 5%.

2256. Borgström, G. 664.85
a Den fysiologiska rollen av etylen och flyktiga ämnen i fruktens mognadsprocess. **(The physiological role of ethylene and other volatile substances in maturing fruits.)**
Sver. pomol. Fören. Årsskr., 1945, **46**: 202-23, bibl. 60.
A review of the literature.

PROCESSING AND PLANT PRODUCTS.

2257. Zweede, A. K., and Nauta, S. 613.2: 634 +635
Het nut van groenten en fruit. **(The use of vegetables and fruit.)**
Tuinbouw, 1946, No. 5, pp. 10-16.

The food value of vegetables and fruits is discussed and tabulated with regard to calories, vitamins (A, B and C), minerals and plant acids. Reference is also made to their carbohydrates, proteins, flavours and enzymes.

2258. Hulme, A. C. 634.11: 581.192
The protein of fruits.
Nature, 1946, **158**: 58, bibl. 2.

A method is described which makes it possible to extract at least 50% of the protein from apples by adding the frozen and ground tissue to a warm borate buffer solution. It is suggested that *in vivo* the cytoplasm has a much higher pH value than the vacuolar sap (pH 3 or lower). The work was carried out at Ditton Laboratory, East Malling, as part of the programme of the Food Investigation Board.

2259. Hulme, A. C. 634.11: 581.192
Protein of fruits.
Nature, 1946, **158**: 588, bibl. 1.

In further elaborating his method (see abstract above) the author has now succeeded in extracting 85% of the total apple-fruit protein. Ammonium sulphate precipitates of the protein complex were found to be partially soluble in water or phosphate buffer of pH 8, the resulting solutions, after dialysis at 1° C., showing a positive oxidase action, a strong peroxidase action and a small but definite amylase action. New methods are being tried to liberate the enzymes.—Ditton Laboratory, East Malling, Kent.

2260. Pollard, A., Kieser, M. E., and Bryan, J. D. 634.11: 577.16
The apple as a source of vitamin C.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 200-2, bibl. 11.

Quoting results of other workers the authors note the very high vitamin C content determined for Bramley's Seedling in England, Sturmer Pippin in New Zealand and Wellington in Sweden. They tabulate their own recent figures determined at Long Ashton. Their range is dessert (4 vars.) Wyken Pippin 3·7 A.A.mg./100 g. to Blenheim 6·3 A.A. mg./100 g.; culinary (7 vars.) Warner's King 3·7 to Bramley's Seedling 18·1; cider (7 vars.) Medaille d'Or 9·1 to Yarlington Mill 34·1 mg./100 g. There are indications from these and other results that the vitamin C content in a given variety is dependent on both site and season. It is obvious that even in an unfavourable season many of the common varieties can substantially contribute to the vitamin C requirements of the diet.

2261. Bondi, A., and Meyer, H. 577.16: 581.192
Carotene in Palestinian crops.
J. agric. Sci., 1946, **36**: 1-5, bibl. 11.

The vegetables examined were: leaves of radish, mangold, sweet potato, spinach, cauliflower, parsley, lettuce, kohlrabi, onion and cabbage. The wild plants examined were: nettle, mallow and portulaca. The influence of the season of growth and the age of the plant on the carotene content was likewise investigated. It appeared that plants grown in winter as a rule contain a higher amount of carotene than plants grown in summer. The carotene content of most of the plants declines in the course of their growth. The

distribution of carotene between leaves and stems was determined in horse beans, beets, spinach, mallow, maize and pencillaria. The leaves contain most of the carotene. [From authors' summary.]—Agricultural Experiment Station, Rehovot.

2262. Dark, S. O. S., and Booth, V. H. 635.13: 577.16

Total carotenoids in carrots.

J. agric. Sci., 1946, **36**: 192-8, bibl. 13.

1. 238 samples of carrots comprising over 70 varieties were analysed for total carotenoids (t.c.) during five autumns. 2. The average t.c. value for common types (excluding certain very high value varieties and the almost colourless varieties) is 13·8 mg./100 g. fresh carrot. Assuming 90% of the carotenoids to be "carotene", the average for the latter is 12·4 mg./100 g. Negligible correlation is found between named variety and t.c. Red-cored and small-cored varieties are slightly richer than others. The pedigree of the seed is the most reliable indicator of probable t.c. content. 3. Six high t.c. varieties and a Red-Cored Chantenay are described in detail. Four of them are of the long slim type with small red cores. One of them (Dippe's Surrey Long) has a mean t.c. value of 37·1 mg./100 g. The high values have been further improved by selection in two subsequent generations. [Authors' summary.]—Horticultural Research Station and the Dunn Nutritional Laboratory, Cambridge.

2263. Hackney, F. M. V. 634.11: 577.16

Enzymic oxidation of ascorbic acid by apples.

Nature, 1946, **158**: 133, bibl. 3.

Enzyme preparations oxidizing ascorbic acid were isolated from Granny Smith, Jonathan and Cox's Orange Pippin apples. The preparations had no phenolase activity.—University of Sydney.

2264. Pollard, A., Kieser, M. E., and Bryan, J. D. 635.64: 581.192

Factors influencing the composition of the tomato. A comparison of varieties and of indoor and outdoor culture.

A.R. Long Ashton Res. Stat. 1945, 1946, pp. 203-8, bibl. 6.

Significant differences were found between tomato varieties in their content of ascorbic acid, sugar and acid. Ascorbic acid content was lower in glasshouse-grown tomatoes than in the same varieties grown out of doors, but sugar and acid content were higher and flavour was superior. Varieties showing the highest ascorbic acid content, both indoors and in the open, were Money Maker and Golden Perfection. In flavour, which was associated with high sugar and acid content, Early Market and Market King were pre-eminent under both conditions. Differences in content, both varietal and environmental, are discussed.

2265. Morris, H. J., Weast, C. A., and Lineweaver, H. 635.13: 581.192

Seasonal variation in the enzyme content of eleven varieties of carrots.

Bot. Gaz., 1946, **107**: 362-72, bibl. 26.

The peeled portions of 11 carrot varieties were assayed for catalase, peroxidase, ascorbic acid oxidase, and in the case of one crop also for phosphatase. The carrots were grown under controlled conditions on the same plot in two different seasons. The first planting was in August, the second in March and the carrots were harvested at two stages of maturity: in January and March, and in July and September respectively. Peroxidase activity was found to be concentrated in the peel, while the other enzymes were distributed more equally over all root tissues. With the exception of peroxidase, which varied little, highest enzyme activity was shown to be associated with most favourable growth conditions, the highest values being recorded for carrots harvested in July, followed in decreasing order by roots harvested in September, March and January. The ratio for the July and January harvests averaged 1·3 for peroxidase, 1·7 for catalase and 5·5 for ascorbic acid oxidase. Varietal differences in enzyme activity ranged from 1·2-fold for phosphatase to 3·3-fold for ascorbic acid oxidase.—Western Regional Research Laboratory, Albany, Calif.

2266. De, S. S., and Subrahmanyan, V. 613.2: 635.655

Nutritive value of soya-bean and related products.

Curr. Sci., 1946, **15**: 231-3.

The present article is written with reference to a recent review of a Report of the Soya-bean Sub-Committee of the Indian Research Fund Association (see No. 2138). It is stated that the use of the whole beans as a cooked food has proved disappointing. In countries where the soya-bean is being used as an article of human food it is mostly used either as a milk or as a sauce. The authors have found that it is possible to obtain a vegetable milk which has the same properties as animal milk at a fraction of the cost of the latter. They showed that the protein of the milk has higher digestibility than that in cows' milk; that the biological value is not much lower and that the net value of the two proteins are practically the same; that the vitamin B complexes of the two milks are of the same order, that, when added to the poor rice diet, soya milk has supplementary value corresponding to about 80% of that of the best cows' milk; that extended germination to about 3 days yields a protein with a higher biological value than that in cows' milk; and that supplementing with calcium leads to further increase in nutrient value.

2267. Bauernfeind, J. C., and others. 664.85.037: 577.16

Vitamin C stability in frozen fruit processed with crystalline l-ascorbic acid.

Fruit Prod. J., 1946, **25**: 324-30, 347, bibl. 12.

Frozen cut-fruit processed with crystalline l-ascorbic acid experimentally and commercially, was assayed for ascorbic acid and total vitamin C content after some months storage. The assays were made of halved or sliced peaches, apricots, nectarines, and of fruit salads, and the results are tabulated. The data show that thawed fruit after 8 to 9 months of storage still retained 80% or more of the added crystalline ascorbic acid as biologically active vitamin C.

2268. Bauernfeind, J. C., and Siemers, G. F. 664.85.11.037: 577.16

Methods of freezing sliced apples with l-ascorbic acid.

Fruit Prod. J., 1946, **26**: 4-7, 27, bibl. 8.

The discoloration and accompanying off-flavour in frozen sliced apples during or following thawing may be significantly delayed by the introduction of small quantities of crystalline ascorbic acid (vitamin C) to the fruit in a specific manner prior to freezing. The successful use of ascorbic acid in the processing of sliced apples with dry sugar largely depends upon the thorough incorporation of ascorbic acid with the sliced fruit-dry sugar mixture. The mixing of sliced apples with dry sugar and ascorbic acid until a uniform mixture is obtained (a few minutes) prior to packaging allows permits syrup to be formed with juice drawn from the fruit before freezing. This provides for better ascorbic acid penetration into the slice and protects against immediate surface oxidation. Two dry sugar packs and a method of packing in sugar syrup are described in detail.

2269. Ulrich, R., Renac, J., and Bernard, F. 664.85.037

Quelques expériences sur la réfrigération des fruits. (**On freezing fruit.**)

C.R. Acad. Agric. Fr., 1946, **32**: 383-5.

Describes trials for preserving fruit by refrigeration. The fruits tested were strawberries (Tardive de Léopold), cherries (Surette), late peaches (Michal), pears (William) apples (Calville). The results were satisfactory for apples

and pears; acid cherries preserved in an atmosphere of carbon dioxide (10%) were satisfactory, but not those in air; the strawberries acquired an undesirable flavour; results with peaches were not wholly satisfactory and further tests will be made.

2270. Barker, B. T. P., and Burroughs, L. F. 634.11: 663.3
The determination of vintage quality in ciders.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 184-92, bibl. 4.

A detailed account of the improved methods adopted at Long Ashton for small-scale cider making and subsequent critical sampling of the cider.

2271. Barker, B. T. P. 663.3: 634.11 + 634.13
Some observations on the stability of cider and perries.
A.R. Long Ashton Res. Stat. 1945, 1946, pp. 199-200, bibl. 5.

1. The existing knowledge of the inherent natural factors—microbiological, chemical and nutritional—affecting the stability of ciders and perries and their susceptibility to the more common microbiological disorders is briefly reviewed. Special reference is made to the incidence of sickness, acetification and ropiness. 2. Observations are recorded of the behaviour of a series of 46 different bottled ciders of known history and composition made in the 1943 season in respect of their susceptibility to the development of micro-organisms after the bottles were opened in May 1944, and their contents exposed to contact with air for prolonged periods. Corresponding tests were made on two subsequent occasions, when the respective ciders were approximately 3 and 7 months older in bottle before being opened. Of the 138 bottles thus under test, over 25% remained up to May 1945, unacetified to a degree perceptible to the palate or nose. There appears to be a definite positive correlation between the "nitrogen" content of the original juice and the resistance of the cider to acetification. The liability to the growth of Penicillium in the exposed ciders becomes much greater as the age of the bottled cider increases, while the vigour of the acetic organisms appears to lessen. 3. On the basis of the facts now available the conclusion is reached that to ensure the highest possible degree of stability in ciders and perries without pasteurization or addition of preservatives the existing processing methods need modification from the time when the primary active alcoholic fermentation begins to wane. The suggested modifications involve the complete exclusion of air from the liquor by its displacement with carbon dioxide and the removal of sedimentary yeast before autolysis becomes appreciable. [Author's summary.]

2272. Peynaud, E. 634.8-1.547.6: 663.25
La maturation du raisin et la composition des vins. **(The maturity of grapes and the composition of wines.)**
C.R. Acad. Agric. Fr., 1946, **32**: 480-3.

A resumé of a doctorate thesis on the chemical composition of wines in relation to the time of harvesting the grapes. Tables are presented showing the differences in composition relative to picking at 10-day intervals from 9 August to 29 September. The most striking changes are increase of sugars, decrease of acidity, increase in weight of the berries; the various acids present are recorded separately. It is claimed that this study of the acids allows maturity to be better defined, and enables one to differentiate between varieties, to obtain a better knowledge of the chemical composition of a wine, even to reconstruct its past, and to recognize the diseases, acidifications and de-acidifications which it has undergone. The study fixes the time when stabilization (e.g. pasteurization) should be carried out, the relative ill-success of which up to the present is explained by a lack of knowledge of the malo-lactic fermentation.

2273. Matiesen, D. 663.813
Några synpunkter på musteriverksamheten. **(Some aspects of fruit juice production in Sweden.)**
Sver. pomol. Fören. Årsskr., 1945, 46: 63-71.

"The apple skin is replaced by the glass wall of the bottle", is the definition given for apple juice. In the author's view, the significance of this beverage is still being underrated in Sweden, as compared with Germany and Switzerland, although marked progress has been made since 1935, when the Swedish Pomological Society began to take great interest in the development of apple utilization. By 1941, 139 fruit juice plants had been established, most of them of a small size. From the average Swedish apple crop of about 100 million kg., i.e. about 15 kg. per head of the population, 560,900 litre apple juice were produced in the record year 1941, i.e. about 0·1 litre per head. Since about 40% of the apple crop are unsuitable for sale or storage, this figure is regarded as very low. Also cultivated and wild soft fruit would yield a suitable material for increased fruit juice production. Products of good and uniform quality are most likely to be obtained from large plants expertly run, with a capacity of at least 50,000 litres, or of 100,000-300,000 litres. A detailed calculation is presented for a fruit juice plant with a capacity of 250,000 litres, the cost price of one-third litre apple juice amounting to 28·5 öre, exclusive of bottle [or very roughly 4s. a gallon.—Ed.].

2274. Schobinger, E. 663.813: 634.8
Herstellung und Verwertung von alkoholfreiem Traubensaft. **(Manufacture and marketing of non-alcoholic grape juice.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 326-33, 347-51.

The quality of non-alcoholic grape juice varies with the season almost as much as that of wine. Experience has shown that the public prefers non-fermented grape juice to have a full red colour. This cannot be achieved with the juice of ordinary red grapes, where the pigment is located in the skin and the red colour appears only after fermentation. In direct-producers, however, the red colour is a property of the juice, which is one of the reasons why this type of grape is eminently suitable for juice production. Other points in favour of direct-producers as a source of non-alcoholic grape juice are that they yield an inferior wine, that they are cheaper to grow, among other reasons because they do not require fungicidal treatment, and that the juice therefore does not contain copper or other heavy metals. Desirable varieties for the purpose, both direct-producers and others, are named. Only well-matured and healthy grapes must be used for juice production, and pressing must not be delayed for more than 24 hours after harvesting. The technique of pressing and decanting, and the appearance of the finished product are discussed in some detail. A good grape juice should have a minimum sugar content of 12-14% and a maximum acid content of 8-9%. Since grape juice is frequently used as a tonic, the Swiss law demands high standards of quality and purity. The paper was read at the Technical School for Fruit Utilization, Wädenswil, in April 1946.

2275. Anon. 663.813: 634.11
New method devised for saving apple flavour.
Fruit Prod. J., 1946, **26**: 3, 22.

It is commercially practical to take out the bouquet of fresh apple juice and then put it back. To manufacture apple essence the fresh juice is heated quickly and just enough to vaporize about 10% of the juice; this 10% includes all the volatile flavouring of the juice. The remaining 90% of the juice can be concentrated into bland apple syrup or commercial apple concentrate, which in the past has not been popular as a beverage base because it lacks apple "bouquet". With the recovered essence, however, it is practical to add a proportional share so that when water is added to the concentrate it becomes again an apple juice with full, fresh flavour. Apple essence can be used for flavouring

ices, sherbets, fruit jellies and beverages. Essence varies with the apple variety, and processors may be able to improve on nature by combining flavour of one variety with body quality of juice from another.

2276. CURL, A. L. 663.813: 634.322
Off-flavour development in processed tangerine juice.
Fruit Prod. J., 1946, **25**: 356-7, bibl. 5.
It is possible to can a tangerine juice of good quality and with a stability similar to orange juice, but suitable commercial methods of extracting the juice without obtaining excessive peel extractives have still to be developed. The presence of peel oil appeared to mask rather than enhance the off-flavour. The fraction responsible for the development of most off-flavour appeared to be the suspended material. Filtering tangerine juice resulted in the loss of nearly all of the characteristic flavour of the whole juice; the filtered juice on storage also developed much less off-flavour than the whole juice.

2277. ESSELEN, W. B., AND OTHERS. 663.813: 577.16
The fortification of fruit juices with ascorbic acid.
Fruit Prod. J., 1946, **26**: 11-14, 29, bibl. 11.
Added l-ascorbic acid is quite stable in processed apple, cranberry and grape juices when these products are fortified at the rate of 50 mg. per 100 ml. In practice this degree of fortification should provide apple, cranberry and fruit juices comparable to canned citrus juices in vitamin C content. When ascorbic acid is added to products such as apple or cranberry juice for fortification purposes it also has a favourable effect on colour retention during storage. [Authors' summary.]

2278. CRUESS, W. V., AND OTHERS. 663.813: 634.3
Experiments on frozen citrus juices and syrups.
Fruit Prod. J., 1946, **26**: 8-10, 25, bibl. 6.
The results are described of experiments carried out with the objects of improving the keeping quality of frozen juices, minimizing curdling, and providing a greater variety of frozen pack citrus juices and syrups. The authors favour vacuumizing and flash pasteurizing for maximum flavour retention and minimum of curdling, though some packers do not agree with them on those points. A flash pasteurizer and cooler is figured. Notes are given on lemonade syrup, punch syrup, and blends of juices; grapefruit plus orange 50: 50 and 50: 100 blends were very pleasing, and there are many other possible combinations.

2279. SINCLAIR, W. B., AND ENY, D. M. 634.334: 581.192
The organic acids of lemon fruits.
Bot. Gaz., 1945, **107**: 231-42, bibl. 9, being *Pap. Citrus Exp. Stat. Riverside, Calif.* **534.**
1. The acidity of lemon juice is due chiefly to citric and malic acids. 2. The difference between the free-acid fraction and the total organic-acid radical (citric and malic) is relatively much greater than the combined acids determined from the alkalinity of the ash. Since this difference is not reflected in the titratable acidity or pH values, it probably represents the quantity of organic acid in the ester form. The alkalinity of the ash represents the organic acid combined in salt form with the excess in organic cations. 3. The titration curve of lemon juice is very similar to that of a pure citric acid solution, provided a correction is made for the combined acid naturally occurring in the juice. There is a definite relation between the pH and the amount of acid in the salt or combined form. 4. The free acids (milligrams per milliliter) increased and the pH of the juice decreased with increase in fruit size. The large reduction in pH (5·20 to 2·60) which occurred in fruits 2·0-4·0 cm. in diameter was due to a correspondingly large increase in free acid. Further increase in fruit size (up to 6·0 cm. in diameter) resulted in a slight decrease of approximately 0·3 of a pH, while the free acids gradually continued to increase in the juice. [From authors' summary.]

2280. SINCLAIR, W. B., AND ENY, D. M. 634.323: 581.192
The organic acids of grapefruit juice.
Plant Physiol., 1946, **21**: 140-7, bibl. 10, being *Pap. Citrus Exp. Stat. Riverside, Calif.* **535.**
The present investigation is concerned with the determinatio of the organic acid constituents in grapefruit juice and th amounts of each that exist in the free and combined form fruit quality being closely associated with the total acidi of the juice. Citric and malic acids are the organic aci of grapefruit juice, and its titration curve is very similar that of pure citric acid solution. The amount of acid prese in the combined form is related to the pH of the juice, whic increases with fruit size, while free acid concentratio decreases during development, as a result of an increase fruit size rather than of a change in the absolute amoun More than 50% of the total cations are utilized in th formation of organic salts. It is not thought that jui acidity would be markedly affected by manurial treatmen increasing available cations.

2281. HUELIN, F. E. 547.458.88
The extraction and uses of pectin.
Food Pres. Quart. Aust., 1945, **5**: 37-43, bibl. 20.
The article is primarily a critical review of the literature the light of the author's experience, together with bri accounts of some of the experimental work carried out the laboratory of the Division of Food Preservation of th Commonwealth Council for Scientific and Industri Research. In several instances further investigation wa necessary to supplement the scanty information availab and to determine the most suitable procedure. In additio to its use in jams and jellies pectin has found extensi application as an emulsifying agent in food products, a recently it has been shown that pectin solution can injected to maintain blood volume in cases of wound shoc There are three important sources of pectin: (1) Citr skins and rag from juice-pressing plants; (2) apple poma from juice-pressing plants; (3) apple skins and cores fro dehydration or canning plants. Fresh citrus residues ma contain about 2% pectin, apple residues about 1-1·5% Other subjects discussed are: The extraction of pecti the preparation of powdered pectin; the jellying properti of pectin; and the effect of heat on pectin.

2282. MANCACCI, S. A. 664.8.036.5
Material handling in the cannery.
Fruit Prod. J., 1946, **25**: 360-2.
Material handling is defined as a co-ordinated progressio of the product in a production system, and not the me transportation of the product between two points. Th basic principles are that (1) needless handling is costly an often impairs production, (2) handling should be correlate with production, (3) all handling systems employed shou be integrated, (4) handling equipment, like productio equipment, should be replaced whenever greater efficien can thereby be obtained. A list is given of some of th leading types of material handling systems with typic examples of their application in the canning industry. A accordion conveyor is illustrated, each section (35 inch closed) of which can be extended to 100 inches; it may set in straight lines, curves or S turns.

2283. SMITH, H. R., AND KRAMER, A. 664.84.656.036.5
The brine test for maturity of canned peas.
Fruit Prod. J., 1946, **25**: 358-9, 372.
Describes a rapid and simple test for pea maturity, and i relation to the alcohol-insoluble solids test. The latter generally accepted as an accurate method for determinin canned pea maturity but not many canneries are equippe for it, and there is need for a simpler method. The brin test appears to be a useful method for this purpose. Tabl are given showing the results of trials in applying the tes Proper operation of the brine test requires that th

emperature of both the brine solutions and the peas be lose to 68° F.

2284. Adam, W. B., and Dickinson, D. 664.84.656.036.5
Estimation of maturity of canned green peas. I.
A.R. Fruit Vegetable Pres. Res. Stat. Campden 1945, 1946, pp. 51-63, bibl. 7.
Consideration of the correlation of results from the large number of tests possible and described here leads the authors to conclude that a test based on the prominence of radicles and the texture in the mouth might give a useful rating for maturity which could be generally used, but that methods based on physical and chemical tests—particularly the alcohol-insoluble solids content and the crushing test—might be used where objective standards were required.

2285. Dickinson, D. 664.84/85.036.5
The internal corrosion of cans III.
A.R. Fruit Vegetable Pres. Res. Stat. Campden 1945, 1946, pp. 32-9, bibl. 5.
An explanation is offered of the phenomena associated with the corrosion of so-called mixed cans, i.e. cans consisting of hot-rolled plate ends and cold-reduced plate bodies. The concept of the Corrosivity Index and its limitations are discussed. The corrosivities of 8 varieties of plum are compared.

2286. Hirst, F., and Adam, W. B. 664.84/85.036.5
Recent progress in the study of hydrogen swells.
A.R. Fruit Vegetable Pres. Res. Stat. Campden 1945, 1946, pp. 12-31, bibl. 19.
Progress at Campden during the last 6 years is reviewed, both theoretical and practical values of particular factors being discussed. Among other conclusions reached is that post-lacquering cans by spraying or flushing is the most promising method of reducing losses from hydrogen swells. Methods are suggested for reducing the corrosive properties of canned prunes. Among vegetables, beetroot, stringless and runner beans and carrots in lacquered cans may give trouble, but vegetables in plain cans are practically free from swells. The possibility that slight leaks may be a cause of the earliest hydrogen swells noted in any season is being investigated. A series of tests is being evolved which may be able to show the chief cause of any particular outbreak.

2287. Cruess, W. V. 634.25 + 664.85.25
Processing for peaches—ahead.
Fruit Prod. J., 1946, **25**: 334-6.
The present status of standard peach products is reviewed and comments are made on several other peach products some of which may have commercial possibilities. The following are discussed: canned peaches, freezing, sieved peaches, crushed peaches, peach nectar, base for home-made ice cream and ices, dehydrated cling peaches, sun-dried freestones, peach brandy.

2288. de Carvalho Godinho, M. A. 664.85.03
O aproveitamento da fruta em conservas, compotas e outros doces. (**Domestic fruit processing.**)
Camp. Prod. agric. Lisboa, Sér. B, No. 42, 1942, 99 pp.
The causes of decay in food products, when left exposed to the air, are discussed and reference is made to the various means by which such products can be preserved. During the processes deterioration of the products may arise and the symptoms are described and tabulated, together with the cause. Descriptions are given of the preparation of jellies (the extraction of pectin from apples and oranges), jams and bottled fruits. Methods of processing various sub-tropical and temperate fruits are given.

2289. van de Plassche, A. W. 664.84.037
De verwerking van groenten. (**Processing vegetables.**)
Tuinbouw, 1946, No. 3, pp. 3-6.
A plea for a greater exploitation of quick-freeze methods of preserving vegetables in Holland. Machines used in three of the operations are illustrated.

2290. de Campos Carvalho Godinho, M. A. 664.84.03
Conservação caseira de produtos horticolas. (**Domestic preservation of vegetables.**)
Bol. Junta nac. Frut., Lisboa, 1944, Vol. **4**, No. 9, 9 pp.
After a brief introduction the following points are discussed: sterilization; classification of food products (non-acid, pH over 4·5; acid, pH less than 4·5); botulism; method of preserving non-acid vegetables; general methods of preserving various vegetables—peas, French beans, cauliflower, carrots, beetroots, chillies and turnips.

2291. Orton, E. C. 664.85.13.047 + 664.85.25.047
Investigations on the use of sulphite dips in the drying of peeled pears and peaches.
J. Coun. sci. industr. Res. Aust., 1946, **19**: 128-39.
The author had set himself the problem of developing a labour- and material-saving method of utilizing reject canning peaches and pears from the Goulburn Valley for dehydration. The aim was achieved by treating peeled, sliced fruit in sulphite dips prior to drying. Extensive trials, data of which are submitted, show that a 1-5 minutes' dip in a solution of pH 5-6 containing 2% SO_2 will give the best results. This relatively high pH value has an unfavourable effect on flavour, but SO_2 losses from sulphite solutions under pH 5 were too large to permit storage for any length of time. However, treatment of the dried product with citric acid will correct the flavour associated with a high pH value of the fruit. A reduction in sulphite strength of the dipping solution may be an alternative to citric acid treatment, though this has not been tried. The keeping qualities of the finished product proved excellent.

2292. Charavanapavan, C. 634.651-1.56
Studies in the preparation, properties and assay of commercial papain.
Trop. Agriculturist, 1945, **101**: 72-6.
Commercial papain is prepared by sun-drying, oven-drying or vacuum-drying the latex extracted by lancing the mature green fruit of the papaya tree (*Carica papaya*). On stirring in a flat dish the latex rapidly coagulates by atmospheric oxidation, which is promoted by a peroxidase. Common salt is suitable for its coagulation and protection. The latex should be dried to a moisture content below 10% unless common salt is used as a protective agent. Commercial papain (not treated with common salt) should have a pale cream colour, a pungent but not unpleasant odour, a moisture content not exceeding 8%, a minimum nitrogen content of 11·5% on a moisture-free basis, and a proteolytic activity not less than 70% of a freshly prepared sample. The method of collecting the latex and preparing the product is outlined.

2293. Anon. 664.85.3
The brined citrus peel industry.
Fruit Prod. J., 1946, **25**: 337-9.
An account of the history and processes of the industry supplying glacé and candied fruit. Orange peels are supplied by Southern California and Florida, lemon peels by Southern California, grapefruit peels largely from Florida and Texas. A close-up view of a pulp-cleaning, deragging machine is shown.

2294. Gragera Torres, P. 633.73-1.56
El beneficiado del café y sus métodos. (**Coffee processing.**)
Publ. Dir. agric. Terr. españ. Golfo de Guinea **10**, 1945, 196 pp.
The publication deals with the methods by which coffee beans are removed from the fruits, cleaned and prepared for market. Details are given of the two methods, the " wet "

and the "dry", and the machines used are described and illustrated by photographs and line drawings.

2295. LÜTHI, H. 663.813

a Zur Eignung der Leichtmetall-Grosstanks in der gewerblichen Süssmosterei. **(The suitablity of large light-metal tanks for commercial fruit juice production.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 293-5.
Preliminary observations and tests are promising.

b PEYER, E. 663.25
Die Behandlung der Fässer, Standen und Kellereigeräte. **(The treatment of wine barrels and cellar implements.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 389-94, being *Flugschrift Wädenswil Versuchsanst. Obst-, Weinb- u. Gartenb.* **53.**

c RENTSCHLER, H. 663.39
Wie gewinnt man gesunden und fehlerfreien Obstwein? **(The production of high quality fruit wines.)**
Schweiz. Z. Obst- u. Weinb., 1946, **55**: 394-5, being *Flugschrift Wädenswil Versuchsanst. Obst-, Wein.- u. Gartenb.* **52.**

d TOŠIĆ, J., AND MOORE, T. 633.85: 577.16
The chemical estimation of vitamin E in vegetable oils.
Biochem. J., 1945, **39**: 498-507, bibl. 16.

e WOKES, F. 634.51: 577.16
Effect of pH in the dye titration of vitamin C in certain plant materials.
Nature, 1946, **158**: 133, bibl. 4.
The materials studied were walnut extracts.

NOTES ON BOOKS AND REPORTS.

2296. ČERNENKO, C. F. (Editor). 634.1/8
I. V. Mičurin. Selected works. [Russian.]
The Reader's Library, State Educational Publishers, Moscow, 1941, 271 pp., 70 figs.
After a short biography of Mičurin and an introduction to his work, this work consists of three main parts: I. A number of his articles on horticultural subjects published from 1905 to 1936. II. An account of the principles and methods of his work. III. Descriptions of his best varieties of apple, pear, *Sorbus* hybrids, cherry, plum, apricot, almond, and small fruits (blackberry, gooseberry, raspberry and *Actinidia*). Addenda consist of data by Mičurin's pupils on certain of his varieties, and a table showing the chief characters of his grapevine varieties.

2297. COPLEY, G. H. 634.1/7
Fruit growing.
John Crowther, Bognor Regis and London, 1946, pp. 130, 9s. 6d.
This slim little book is essentially for the amateur and to him it should prove both instructive and helpful. The author, generally speaking, without emphasizing his reasons, inculcates sound fruit growing practice. All the fruits normally grown in this country are considered and in addition figs and vines. Finally, incentive is given by suggestions on budding and grafting to the enterprising amateur who wants to do his own propagating.

2298. EFIMOV, V. A. 634.23
The cherry.
LEVITSKAJA, K. A. 634.711
The raspberry.
CVETKOVA, E. N. 634.72
The currant.
PAVLOVA, M. A. 634.75
The strawberry.
Published in Russian by Moscow Workers, pp. about 70 each, illustrated, 1940.
These four booklets are headed "For the assistance of the collective farm horticulturist". They all have the same preface which points out that the yield of fruit in the U.S.S.R. is far below what it should be, and introduces this series of publications, the object of which is to encourage the cultivation of fruit on collective farms, state farms and in cottage gardens. Each book has a striking front cover and outlines clearly, along usual lines, the raising, propagation and cultivation of varieties grown in Russia, and pests and diseases of particular fruit plants. A few points may be noted. One variety of strawberry, Texas, raised by Mičurin, is said to bear fruits individually averaging 10 grams. The diseases are treated very briefly and there is no mention of virus diseases of the bush fruits and strawberries. A disease of raspberry referred to as chlorosis is said to be transmitted by vegetative propagation but to be of little importance in soil well cultivated and manured. The only diseases of cherry mentioned are gummosis, brown r (serious some years), and a fungal leaf and fruit spot (t organism left unnamed).

2299. HAWLEY, R. C. 634.95
The practice of silviculture. 5th edition.
John Wiley, N. York, and Chapman & Hall, London, 1946, pp. 354, $4.
We understand that an extended notice of this work w appear shortly in *Forestry Abstracts*. It will perha suffice here to quote from the preface that it has be thoroughly revised and in part rewritten, and to say that deals with silviculture pure and simple, is attractive printed, illustrated and bound.

2300. HIGGINS, V. (Editor). 635.9(42)
Some good garden plants.
Royal Horticultural Society, Vincent Square, London, S.W.1, 1946, pp. 81, 6s.
An illustrated account of 326 ornamental garden plan which have received the "Award of Garden Merit bestowed by the R.H.S. between 1922 and 1945. T descriptions are set out alphabetically and, in addition, t plants are usefully indexed according to habit, etc.

2301. HOARE, A. H. 635.1/7
Vegetable crops for market.
Crosby Lockwood, London, 1945, 2nd edition, pp. 188, 12s. 6d.
This excellent book, the contents of which apply particula to growers in the eastern counties of England, has, howev a much wider appeal. Revisions since its first appearan in 1936 have not essentially altered its character or val Especially useful is the chapter devoted to soil, clima manuring and tillage. The reviewer is glad to note emphasis laid on the proper preparation and conservati of farmyard manure, practices which are too often neglect On page 83 with regard to broad beans the author writ ". . . spring sown crops are not so liable to attacks black fly". But surely, is not the experience of every gro contrary? Perhaps for "not so liable" *read* "m liable". Only a few pages are devoted to pests a diseases, and less than one page to control measures. would be a great boon if any future edition could deal m fully with these subjects. H.C

2302. HUDSON, P. S., AND RICHENS, R. H. 575(47)
The new genetics in the Soviet Union.
Bulletin (not numbered) *imp. Bur. Plant Breeding and Genetics*, 1946, pp. 88, bibl. 280, 6s.
This bulletin was written "with the intention of evaluat the contributions of the Russian non-Mendelian genet school (headed by Lysenko) and of describing for the ben

of English readers its characteristic tenets ". The authors, who in its preparation must have painfully waded through masses of contentious literature, deserve the thanks not only of geneticists but of all interested in the improvement of economic plants for their well-balanced, fair and surprisingly easy-reading summary of the present position. To the horticulturist the account is particularly interesting as throwing light on Mičurin, and the reader will find a brief, concise account of his struggles and ideas, including his use of the mentor theory. Although throughout, a nice balance is almost cloyingly observed, the reader comes inevitably to the conclusion—can it be designedly ?—that Lysenko has not succeeded in debunking Mendel—oh dear me, No. For its sound common sense, for its weighty subject matter, for its pleasant sparks of scientific repartee we heartily commend this bulletin to our readers' notice.

2303. IVANOV, N. N. (Editor). 634.1/8: 577.1:581.19
Biochemistry of cultivated plants. Vol. VII. Fruit and berry cultures. [Russian.] Seljhozgiz, Moscow-Leningrad, 562 pp., bibl. numerous, 18 roubles.

The 7th volume of this series is of special interest to the horticultural biochemist since it includes the chemistry of the cultivated fruit and berry bearing plants. Each chapter, written by a specialist, is devoted to one species, reviews the chemical composition of that particular plant and concludes with a bibliography. Thus chapter I (the biochemistry of the apple) occupies 64 pages, has many tables and a number of graphs, with special reference to varieties of apple grown in Russia, and a bibliography of 4½ pages. Other plants dealt with in this volume are pear, grape-vine, plum, peach, apricot, cherry, citrus species, strawberry, raspberry, blackberry, currants, gooseberry, cranberry (*Vaccinium oxycoccus*), cowberry or red whortleberry (*V. vitis-idaea*), bilberry (*V. myrtillus*) and bog whortleberry (*V. uliginosum*), walnut, hazel-nut (*Corylus* spp.), almond, olive, fig, pomegranate, persimmon (*Diospyros*), mulberry, wild rose, and *Actinidia*.

2304. IVANOV N. N. (Editor). 635.65 + 635.61
Biochemistry of cultivated plants. Vol. IV. Vegetable and melon crops. [Russian.] Seljhozgiz, Moscow-Leningrad, 1938, 446 pp., bibl. many, 9.90 roubles. [Received Aug. 1946.]

This is the fourth volume of a series of publications on the chemical composition of cultivated plants. The present volume includes potato, sugar beet, cabbage, tomato, carrot, leak and garlic, water-melon, melon, cucumber, Jerusalem artichoke, sweet potato, chicory, pepper, lettuce, spinach and sorrel, rhubarb. The botanical classification and geographical distribution of each plant is given, and then a review of the work that has been carried out on its chemical composition, with tables and notes on the chief elements and organic compounds present. Each chapter closes with a list of relevant publications.

2305. KEEBLE, SIR F., AND RAWES, A. N. 634.1/7
Hardy fruit growing. Macmillan, London, 1946, 2nd edition, pp. 342, £1.

The first edition of this book in 1936 had a considerable success with amateur and professional fruit growers. The simple and clear manner in which the information was set out, its catholicity yet freedom from divagating frills, rendered it pleasantly digestible in hours of ease and useful to consult in times of doubt. A second edition has now appeared, and not before it was wanted, for No. 1, like most other good things these last years, became progressively more difficult to discover. It was emphatically a father-to-son book and seldom appeared in the second-hand bookshops. The text of the new edition has been revised and in part rewritten to incorporate such results of recent research as are of practical value. With G. Fox Wilson and D. E. Green, Entomologist and Mycologist to the Royal Horticultural Society, as sponsors, the pages dealing with pests and diseases possess a terse practicability which will endear them to the afflicted grower, suffering vicariously with his trees. With their aid diagnosis and control may be determined almost before the bug can get a second bite. The book is divided into three main sections: I. The making and maintenance of orchards, covering the whole routine of orcharding, its principles and practices, including propagation. II. Hardy fruits. Descriptive lists of varieties for all purposes, rootstocks, pollination, pests and diseases. III. Commercial fruit-growing. Here, as in the previous edition, Major Monro has been enlisted (or should it be commissioned !) to tell with point and precision just what the consuming public wants and how it wants it. If peace hath her victories no less renowned than war, the inducing of the grower to pay some attention to the Major's pertinent remarks would certainly be one of them. The 21 excellent photographs which illustrate the book have been well chosen to instruct no less than to adorn and, what is more, are inserted vis-a-vis the relevant text. Production and printing, to the layman at least, seem to be in no way inferior to the pre-war edition. The small increase in price should not deter even the traditional Aberdonian.

G.St.C.F.

2306. KELLERA, B. A., AND LYSENKO, T. A. (Editors). 634.1/8
I. V. Micurin's work. III. Notebooks and diaries, 1940, 407 pp. *IV. Collected notes,* 495 pp. [Russian.] Seljhozgiz, Moscow-Leningrad. [Received Aug. 1946.]

These are the third and fourth volumes of the series of books describing the work of the Russian horticulturist, I. V. Mičurin (1855-1935). Volumes I and II have been already noted (*H.A.*, 10: 1268 and 16: 1199). Vol. III consists of notes from his diaries, various observations, themes and articles, i.e. notes jotted down during the course of his work; it contains 78 figures, 8 coloured plates of various fruits and several photographs of Mičurin himself in his fruit plantations. It is in two parts. I. Observations of plant life and phenology. II. On raising new forms and varieties of plants: notes on methods. Vol. IV, completing the series, contains a number of published and unpublished articles, notes and letters; it has 50 figures, 9 coloured plates of fruits and several photographs of Mičurin with his assistants and collaborators. It closes with an index to all four volumes. Many of the notes are unimportant; some of them are of the nature of " Answers to Correspondents ", and brief notes are given on pests and diseases of fruit trees, and on orchard operations. Other articles are more original and deal with such subjects as a new hybrid rose; roses for the open ground in mid-Russia; a melon for mid-Russia; a perennial cucurbit from the Siberian forest; frost damage in 1928-9, etc. Mičurin's versatility is shown by certain pieces of apparatus designed by him, described and figured on pages 7, 41 and 85. On pages 358-81 are tabulated 132 new varieties of fruit plants (mostly apples) raised by Mičurin, with the names of the parent plants and their sources, and on pages 382-428 a further list of 275 seedlings raised by him but not yet fruiting at the time of writing.

2307. LISAVENKO, M. A., AND OTHERS. 634.1/8: 551.566.3
The experiences of Micurin's Siberian disciples. [Russian.] West Siberia regional publications, Novo-Sibirsk, 1936, illustrated, 107 pp. [Received Aug. 1946.]

This book consists of (1) a biography of I. V. Mičurin by Lisavenko, (2) letters by Mičurin to Siberian fruit-growers published originally in various journals from 1925 to 1934, (3) a series of 15 articles by Siberian fruit-growers who had

followed Mičurin's precepts on (*a*) horticultural experiments and trials in horticulture, (*b*) collective horticulture.

2308. Meržanian, A. S. 634.8
Viticulture. [Russian.]
Seljhozgiz, Moscow, 1939, 387 pp., 191 figs., bibl. 204, 52.50 roubles. [Received Aug. 1946.]

After a general and historical introduction leading to the cultivation of the grape-vine in Russia, this book comprises three sections dealing with I. The biological factors underlying the cultivation of the vine, including the organography, anatomy and physiology of the various organs and the biological cycle of development (132 pp. with many figures), II. The ecology of the vine in relation to environment, climate, soil and its cultivation, functional disorders, pests and diseases and their control, III. Vine-growing, propagation, choice and preparation of the ground, planting, pruning operations carried out on the green parts of the plant (pinching back shoots and leaves, ringing, thinning), training the vines (illustrated), cultivation of the soil, manuring and irrigation, the restoration of old vineyards; and the cultivation of dessert varieties.

2309. Metlickii, Z. A., and Maleev, E. E. 634.1/8-1.537
The fruit-tree nursery. [Russian.]
The Mičurin Res. Inst. Fruit Cult., Moscow, 1935, 339 pp., 150 figs., bibl. 151. [Received Aug. 1946.]

A text-book on the layout of a fruit tree nursery with an account of the various operations involved in raising and propagating nursery material, including budding and grafting (technique illustrated), and packing the young trees for distribution and export.

2310. Nelson, A. 581: 633/635
Principles of agricultural botany.
Thomas Nelson & Sons Ltd., London, 1946, 556 pages and numerous illustrations, 35s.

Professor Percival's "Agricultural Botany" [see eighth edition reviewed in *H.A.*, 12: 1566] has long been a mainstay of students of agriculture in Britain, but so much progress has been made along various lines of the subject in recent years that a new approach has been necessary. This need has been met by Dr. Nelson's book, which not only presents to agricultural students the general principles underlying the growth of agricultural plants, but also shows how the application of recent scientific research in botany points the way to improved farm practice. There is a tendency at the present time to decry text-books in favour of monographic treatises by experts. But agriculture is so vast a subject that the student approaching it possibly for the first time, requires a basis of general principles; to overload him with masses of detail and theory will only confuse him. Lists of books for further reading accompany the chapters, but the agricultural student with limited time at his disposal cannot hope to read even a few of them. General botanical principles are outlined and special points are emphasized by profuse visual illustration—17 plates in colour, 128 half-tone plates and 182 text figures. The scope is indicated by the titles of the four sections: 1. Morphology and anatomy; 2. Physiology—these two sections with special reference to agricultural plants; 3. Negative factors in food production (weeds; insect pests; disease); 4. Heredity, evolution and classification. The chapter on classification and identification is very brief (10 pages of text and text-figures), and for descriptions of agricultural plants the student must have recourse to Part IV of Percival's book headed "Classification of farm crops" (some 250 pages) and Part V on "Weeds of the farm" (over 40 pages). In Dr. Nelson's book most of the matter of Sections I and II are in general botanical terms (with examples mostly from agricultural plants) and so can be studied with profit by the horticultural student, who will find discussed the recent work on such subjects as minor elements in plant nutrition, and plant hormones as root promoting substances and a herbicides. This indicates the need for a similar book o the principles of horticultural botany. The wealth o illustrations doubtless accounts for the high price (for student) but such plates and drawings greatly enhance th value of the book and serve to emphasize the informatio in the text.

2311. Minkevič, I. A., and others (Editors). 633.854.78
The sunflower. [Russian.]
Regional Printing Office, Krasnodar, 1940, 312 pp. [Received Aug. 1946.]

The different chapters are by specialists. Each conclude with a summary and in most cases with a list of the relevan literature. The scope is shown by the chapter headings Sunflower breeding; Floral biology; Root system; Nutri tional function of the roots; Cutting back and the regenera tion of roots in relation to cultivation and manuring Cutting back roots, transpiration and the entrance c nutritive substances; Mineral nutrition of healthy sunflowe plants and those parasitized by broom-rape; Manuring Agrochemical basis for manuring; Field manurial trials The influence of nitrogen-bacteria on the yield; Manurin and oil production in the seeds; The depth of cultivatio between the rows; Basic agricultural operations of th shock workers.

2312. Smirnov, N. M. 634.11
Raising apple trees.
Moscow workers, State agricultural publishers, 1940, 128 pp., 33 figs.

This book, of a size to go easily into one's pocket, describe the raising of apple trees from the seed to the time the come into bearing. The first chapter describes the treatmer of the seed before sowing, the preparation of the soil fc sowing, the sowing itself, and pricking out the seedling The second chapter deals with the operations necessar during the seedling's second year and describes in som detail, with illustrations, budding the seedlings with scio varieties. The operations described for the third yea include grafting (illustrated) and, for the fourth year, shapin the trees with examples of pruning for shaping the head Planting the trees in their permanent quarters is then de cribed with further information for shaping the tree. Th plantation operations as the trees come into bearing includ the protection of the trees from frost and from the ravage of pests and diseases with special reference to the life histories and control of the apple sucker, apple blosson weevil, and codling moth. In this connexion it is to b noted that the author advocates attracting birds (to devou the larvae of such pests) into the plantations by providin nesting boxes, particularly for the blue titmouse, an describes, from personal experience, the good result obtained by these measures. An appendix consists c recipes for a number of insecticides and fungicides and tw for protecting the trees against hares and mice.

2313. Stiles, W. 631.811.9
Trace elements in plants and animals.
Cambridge University Press, London, 1946, pp. 189, bibl. 432, 12s. 6d.

This book is an excellent introduction to the subject and is useful reference book for those working on trace element The first chapter is devoted to a short historical introductio a feature of which is a list of plants for which it is claime each of the elements manganese, zinc, boron, silico aluminium, chlorine, copper, molybdenum, tungsten an gallium are either beneficial or essential.
The second chapter describes the main methods for studyin trace element problems in respect to plants. One of th most important methods consists in growing plants in culture solution deprived of the element under study. certain amount of each essential element is introduced i the seed or cutting of the plant. This can hardly be avoide

It is necessary to reduce to a minimum the amounts of the element introduced in other ways, viz. as impurities in the water and salts used in preparing the culture solutions and by solution from the vessels used to hold the culture solution. Methods that have been used for doing this are described. The growing of plants in culture solutions deprived of selected elements not only provides evidence of the essential nature of certain elements but also gives opportunities for studying the symptoms developed by the plants when so grown. Many of these symptoms are of striking appearance. Similar symptoms are often seen in the field. These are widely used for the diagnosis of mineral deficiency on the assumption that they are specific for the mineral deficiencies with which they are associated in solution culture.

Analysis of the plant provides another method for diagnosing mineral deficiency. Because the trace elements occur in only minute amounts in the presence of relatively large amounts of the major elements phosphorus, potassium and calcium, special methods of analysis are necessary.

A survey of published work on methods, though uncritical, is of special value to the research worker who requires a guide to the literature on this aspect but is prepared to try out the methods for himself.

Finally, deficiencies may be diagnosed by introducing elements in solution into selected parts of plants and observing their effects in comparison with neighbouring untreated parts. The "injection" methods for doing this are described briefly.

The longest chapter in the book contains descriptions of plant diseases attributable to deficiencies of manganese, zinc, boron, copper and molybdenum. These are illustrated by 12 plates. Key references to the literature are given. This chapter gives a readable and valuable survey of the subject.

The little that is known about the functions of trace elements in plants is stated briefly but clearly and the various lines of thought on the subject are indicated.

A single chapter is devoted to trace elements in animals. First place is given to diseases due to trace-element excesses. Poisoning due to selenium and molybdenum and diseases due to deficiencies of copper, iodine and manganese are described. An account is given of the "pining" diseases described in Scotland, Australia and New Zealand, to all of which cobalt deficiency is a contributory cause. This chapter ends with a brief account of the functions of trace elements in animals.

The concluding remarks in the last short chapter indicate the lines along which much rapid progress is being made at present and along which the author thinks most is to be hoped in the near future. A striking point made is that: "The realization of the importance of trace elements in plants and animals is actually very recent for, apart from a few pioneer observations, our present not considerable knowledge of the subject is the result of the work done during the last 25 years, and, indeed, for the most part, during the last decade."

The book covers this rapidly expanding subject so well that it would be ungrateful to call attention to the few respects in which it might be improved. W.A.R.

2314. SWARBRICK, T. 577.17
Harnessing the hormone.
Science at Your Service No. **1**, 1946, Grower Publications Ltd., London, pp. 52, 3s. 6d.

Synthetic growth substances have several established uses in horticultural practice, and in selecting them as subject for the first of the new "Science at your service" series the publishers appreciate their still greater potentialities. In this they share the enthusiasm of the author who has provided a general account of this modern development of plant physiological science as well as a helpful guide to the types of hormone product already being marketed.

Individual chapters are devoted to methods of reducing pre-harvest drop of apples and pears, of promoting the rooting of cuttings, and of producing certain fruits such as tomatoes parthenocarpically, and independently of normal pollination. In a further chapter there is a discussion of the ways in which growth substance sprays may in the future be used for avoiding or otherwise overcoming frost injury to blossom and young fruit, while reference is also made to other uses not primarily for the fruit-grower, notably as selective herbicides in weed control and for improving potato storage.

Throughout the book Dr. Swarbrick intersperses his ideas on future developments of growth substance effects, a fact which must not be overlooked when going to it for information, for much experimentation is essential between an idea and its widespread practical application. Nevertheless, one aim of the author is to stimulate intelligent enterprise in the use of these products of chemical synthesis, and this is facilitated by the insight thus given into the underlying principles of their action. But in one respect one must dissent from Dr. Swarbrick, and that is in the matter of definition of the term "hormone" as applied to plants. Surely its limitation to the natural auxins, and its subordination to the omnibus term "growth regulating substance" is incompatible with the view that there are other, as yet unidentified, hormonal substances native to the plant organism. E.S.J.H.

2315. TAIROV, V. E. 634.8+663.25
A reference dictionary of viticulture and commercial processing of grapes. [Russian.]
Seljhozgiz, Moscow-Leningrad, 1934, 192 pp., 88 figs., 3.25 roubles. [Received Aug. 1946.]

This small book, written for Russian vine-growers and wine producers, is thus wholly in Russian, but it will prove a most useful supplement to an ordinary Russian lexicon for those horticulturists and biochemists of other countries who have some knowledge of the Russian language, for it includes many words and much information not found in an ordinary dictionary. It is in encyclopedia form with notes on subjects connected with vine-growing, the microbiology and chemistry of wine production and the wine-growing regions of Russia. The figures illustrate methods of training vines, vine diseases and pests, and apparatus and machines used in wine production. Some of the articles include a bibliography relating to the subject.

2316. TAYLOR, H. V. 634.11(42)
The apples of England.
Crosby, Lockwood & Son, London, 3rd edition, 1946, pp. 206, £1 10s.

The second edition of Dr. Taylor's useful and well-known work on English apples has within two years been succeeded, or indeed superseded, by a third. Superseded, because the embellishment of the new edition with 36 life-size coloured photographs of selected important varieties will render the earlier "penny plains" of that much less account. Whatever the original purpose of Dr. Taylor's book, it is mainly for its value in identification that growers keep it upon their shelves and for that reason, if for no other, the new plates must prove a very considerable asset. Great care has been taken to select as typical specimens as possible for the photographs and the fact that all but two came from the East Malling Research Station is a guarantee that no risks were taken. Leaves of fruiting spurs and a bisected fruit to illustrate the flesh and pips are shown on each plate. Purists or professional carpers, with which we think the world is at present somewhat overstocked, have suggested that while the plates are pretty to look at they have small identification value because certain characteristics, chiefly of form, are not always easily discernible. But does that matter so much? Pomologists, raging furiously together as to whether an apple is conical or just oblong/oval—and it is surprising what heat a matter such as this can engender among the hierarchs—will now be able by reference to the plate to save face and possibly life by proving that both of them are right! To the ordinary grower not overburdened with

specialist knowledge the plates will convey an extremely good notion of the variety depicted and that, we suppose, is the idea. The text of this book has been reviewed in *Horticultural Abstracts* on two previous occasions (*H.A.*, 6: 612 and 15: 921) and little change has been made since the second edition. Further comment is, therefore, unnecessary. The inclusion of the plates has naturally increased the price, but the increase is small compared with the advantages gained. G.St.C.F.

2317. VERCIER, J. 634.1/8
Arboriculture fruitière. **(Fruit growing.)**
Librairie Hachette, Boul. St. Germain, Paris, 21st edition, 1946, pp. 408, fr. 114.

This stout little book, suitable for slipping into quite a small pocket, is addressed primarily to the amateur, who has time to bestow on perfecting his collections of fruits and vines. It is nevertheless extremely useful to the scientific fruit-grower who wants to study French methods but is somewhat at sea with regard to terminology. The 366 illustrations are not beautiful, but they are essentially practical and useful. Every step in the cultivation of the common, temperate, top and bush fruits and vines is considered in detail, varietal quality is discussed and the use to which the final product is put. Packing and marketing are considered and, needless to say in a French work, much attention is paid to pruning and training. A final chapter is devoted to a highly ingenious system of variety identification by observation of the movement of a pendulum held over the fruit to be identified. The author is a convert to the method, and while not claiming infallibility for it he considers it an extremely useful aid to identification.

2318. VYVYAN, M. C. 577.17: 634.1/8
Fruit fall and its control by synthetic growth substances.
Tech. Commun. imp. Bur. Horticulture **18,** 1946, pp. 73, bibl. 115, 3s. 6d.

After a consideration of the phenomenon of fruit fall, of its incidence throughout the life of a fruit and of the factors that influence it, the author surveys the work already accomplished towards its control with special reference to the use of synthetic growth substances. He summarizes the position and makes recommendations.

2319. WORMALD, H. 632.1/4: 634.1/8 + 633.79
Diseases of fruits and hops.
Crosby, Lockwood & Son, London, 2nd edition, 1946, 302 pp., 42 plates, text figures 24, 21s.

The first edition of this book appeared in 1939 and was reviewed in *H.A.*, 9: 352. It was reprinted with Addenda in 1945 (see *H.A.*, 16: 547); that issue was soon exhausted and another edition called for. In this, the Second Revised Edition, the general arrangement of the original has been retained, but additions and alterations in the text have brought the information more up to date; the Addenda, too, have been increased to bring to the notice of growers, advisory officers and students the more recent results obtained by research workers in relation to diseases of fruit trees, including mineral deficiencies and virus diseases of fruit trees in Britain. Twelve new illustrations have been added.

2320. C.S.I.R., AUSTRALIA. 633/635 + 664.84/85(94)
Nineteenth Annual Report, Council for Scientific and Industrial Research, Australia, for year ended 30th June 1945, 1946, pp. 164, 7s.

Plant Investigations. Vegetable oil plants under study are soybean, linseed, rapeseed, sesame and safflower. Work continues on guayule in order to assess its potentialities as a peacetime rubber source. Preparations are noted at Stanthorpe, Qd, for the multiplication on a commercial scale of the Merton 793 and 789 apple rootstocks which have remained immune to woolly aphis and have produced better trees of Jonathan and Granny Smith over 8 years than other stocks. The content of hyoscine and atropine in the leaves of *Duboisia myoporoides* and *D. leichhardtii* is under close examination. Work is also in progress on the opium alkaloids and on the drug properties of native plants. Investigations on vegetable crops concerned potatoes (virus resistance), tomatoes (disease resistance and diseases), peas and beans (agronomic characters), cabbage, red beet, carrot, onions (improvement by breeding). Various problems of flax are also being dealt with.

Entomological Investigations. Much of this section is of interest to horticulturists. It includes:—Insect control of noxious weeds; D.D.T. as a means of controlling a large number of animal and plant pests; orchard pests including oriental peach moth, codling moth, light brown moth, citrus red scale (*Aonidiella aurantii*), brown olive scale.

Irrigation Settlement Investigations. At Merbein the damage done to vines by the drought, which lasted through two seasons 1943/44 and 1944/45, is noted. Chlorosis of currant vines has been identified as lime-induced iron chlorosis. It is associated with soils of high pH, often highly calcareous, and can occur with or without the presence of high salt concentrations. Experiments continued on substances for dipping sultanas and other vine fruits including paraffin oil-sulphonated oil and peanut oil-sulphonated oil emulsions. From Griffith come brief reports on orange cultivation trials, irrigation of orchard and vegetable crops, drainage, soil reconditioning.

Food Preservation Investigations. Work is reported on:—*Clostridium botulinum* in canned vegetables; sulphur changes in dried apples; sugars in dried peaches and pears; pectin extraction from citrus residues; sodium alginate for jellying fruit juices; natural wax coating of apples; vitamin C content and addition to processed foods; oil and wax dips for apples; phenomena in dried apples, apricots, peaches and pears; vegetable canning, varietal and other studies; hydrogen swells in pears; fruit juices and new equipment for their manufacture; fruit spreads; can enamels and lacquers; dehydration, varietal suitability of vegetables and storage and packing of dehydrated vegetables.

2321. BRITISH GUIANA. 633/635(881)
Administration report of the Director of Agriculture B. Guiana for 1944, 1945, pp. 26.

Horticulturally it is of interest to note that coconut, the third most important crop in the Colony, covered an area of 34,625 acres, coffee 3,397 acres, citrus and other fruit 6,169 acres. Supplies of citrus fruit did not quite come up to demand. There was continued increase in nursery citrus stock distributed by the Department.

2322. CAMPDEN. 664.84/85.036.5
Annual Report of the Fruit and Vegetable Preservation Research Station Campden 1945, 1946, pp. 63.

In addition to work described in some detail (see abstract 2008, 2284-86) a few lines are devoted to investigation of the following subjects:—vacuum in cans, vitamin C in canned fruits and vegetables, quality of canned fruit, pH of canned vegetables, disposal of factory effluents, fruit gumming in plums, frozen pack fruits and vegetables.

2323. CEYLON. 633/635(54.8)
Administration Report of the Acting Director of Agriculture, Ceylon, for 1944, 1946, pp. 23, 50 cents.

Entomology. Breeding and liberation of the Eulophid parasite of the coconut caterpillar were continued. Smoking of orchards during harvesting once again afforded successful control of fruit-piercing moths. Beekeeping trials are in progress. *Plant pathology.* Certain rubber clones prove more susceptible to bark rot and to the disinfectants used to control it than others. A new virus of tobacco was recorded. *Rhizoctonia solani* on tobacco grown in paddy fields was controlled by the use of shallow drains. *Chemistry.* A satisfactory process for the preparation of high

grade papain has been worked out. Work on pyrethrum flower analysis continues. Tea driers appeared to be suitable for pyrethrum drying. *Cinchona ledgeriana* was found to have a higher total alkaloid and quinine content than cinchona hybrids. This total increased with age. The quality of citronella oil was not affected by manuring. At Mapalana K and P were more important for this crop than N. *Botany*. Cultural trials on *Cinchona ledgeriana* have been laid out. The technique of cleft grafting has been perfected and many *C. succirubra* stocks were top-worked with *ledgeriana*. Better rooting was obtained with terminal than with sub-terminal cuttings and with short (<2 inches) that with long (>4 inches) cuttings of cinchona species. A 10-acre seed station for temperate vegetables was opened at Ambawela. Here successful seed setting was achieved in carrots and several crucifers including knol-khols and cabbage. Varieties in which seed was produced on a commercial scale included peas, lettuce, cauliflower, radish, rhubarb, dwarf French beans and runner beans. *Horticulture*. Activities are largely concerned with the establishment and maintenance of nurseries for the provision of planting material for colonists and village agriculturists. Stock-scion experiments at different centres on citrus, mango, avocado, sapodilla, cherimoyer, etc., are briefly reported. *Tobacco*. Rotation, costings and manurial experiments are reported. *Botanic Gardens*. Work restricted to maintenance.

2324. CYPRUS. 633/635(393)
Annual Report of the Cyprus Department of Agriculture for 1945, 1946, pp. 8, S1.
Considerable progress has been made in producing vegetable seed and contracts have been signed for the production of seed of cauliflower, leek, onion, tomato, lettuce, runner bean, cucumber and carrot for 18 different English seed firms. The issue of budded olive trees showed a considerable increase, some 20,000 trees being sent out in 1945 to farmers by the Department. As the result of the increased demand for deciduous fruit trees two sub-stations have been set up at Galata and Saitta at lower altitudes than that of the Trikoukkia station. At the Viticultural Station phylloxera-resistant stocks have been grafted with different varieties for testing purposes.

2325. DANSK GARTNERFORENING (DANVIG, A. M., Editor). 633/635(489)
Aarbog for Gartneri. **(Horticultural Yearbook.)** S. L. Møllers Bogtrykkeri, Copenhagen, 1945, Vol. **27**, pp. 254, Kr. 2—.
The yearbook contains much useful information for those interested in the organization of Danish horticulture, its research and publications (see also *H.A.*, 16: 1193). The bulk of the experimental work reported consists of manurial trials with vegetables and flowers carried out at a number of market gardens. Other trials concern potting composts for flowers; cucumber, tomato and strawberry varieties; varieties of different flowers, foremost among them *Primula malacoides*; and vegetable varieties, reports of the last-named trials covering about 60 pages.

2326. EAST MALLING. 634.1/7
Annual Report East Malling Research Station, 1945, A29, 1946, pp. 148, 5s.
This report is drawn up along the same lines as those of previous years and consists of four parts: I. The Experimental Farm: notes on yields from various plantations including propagation beds. II. General review of research work, with lists of papers published during the year: summarizes the work carried out by the various sections during 1945. III. Research reports: fourteen papers by members of the staff on lines of work which have reached a stage when preliminary results can be published, together with a weather report for the year. IV. Bulletins for fruit-growers: eleven short articles showing the practical results of the experimental work. The papers in Parts III and IV are abstracted in the relevant sections of this number of *H.A.*

2327. FLORIDA. 633/635(75.9)
Annual Report of Florida Agricultural Experiment Station for 1944-45, pp. 229.
All interested in sub-tropical horticulture should see these annual reports from Gainesville, containing short notes of results or progress in very numerous projects. Investigations of wide horticultural interest in the current number include the following:—Propagation and cultivation problems of tung oil; cover cropping pecans; citrus fruit storage; fumigation of flower bulbs; cultural requirements of mu oil tree (*Aleurites montana*); relation of zinc and magnesium to growth and reproduction in pecans; effect of growth substances on shedding of pecans; dehydration of vegetables and fruit; effect of environment on vegetable composition; investigations of the U.S. Field Laboratory for tung. Other departmental reports appear on plant pathology, soils, celery investigations, potato work, work at the watermelon and grape laboratory, vegetable crops. Reports are also included on the work of individual stations as follows:—*Citrus station*. Investigations concern stem end rot of fruits, nutrition including soil-plant correlations and physiological relations, control of pests, particularly scales and mites, fruit colouring, control of decay in oranges by thiourea and of other rots by various methods, oil spray treatments, soil moisture relations, salt content of irrigation waters. *Everglades Station*. Includes work on *Sansevieria* and other fibre crops, also vegetables. *North Florida Station*. Includes tobacco work.

2328. IOWA. 634/635(777)
Report of Agricultural Research of the Iowa Agricultural Experiment Station for the year ending June 30, 1945, 1945, pp. 355.
The report contains short notes of progress on a very large number of projects and one much fuller report of interest to horticulturists, namely on apple breeding [for which see abstract 1793]. Among projects touched on more briefly are the following:—Machinery for turning hemp windrows, milling hemp, cultural practice for and varietal improvement in hemp. Contour strip planting has been successfully applied on steep hillsides to the cultivation of grapes, plums, berry fruits, nuts and sumac for tannin in conjunction with suitable mulch crops. Of the rubber plants tested, yields of less than 1% rubber and poor quality products have been usual, the common milkweed being the most promising. A useful account is given of the propagation, growth, harvesting and drying of sumac (*Rhus glabra*) for tanning purposes. Work on the bionomics and control of the codling moth and apple maggot is reported. The Willow Twig apple variety was found to be outstandingly rich in vitamin C and might well be used for breeding for the production of high vitamin varieties. Soilless culture proved highly successful for roses. Working trials with apples show Virginia Crab and Hibernal pre-eminent as intermediate stocks. For dwarfing purposes Clark's Dwarf has shown itself much hardier than the English rootstock selections. It is a poor rooter but could well be used as an intermediate on a hardy, resistant stock. Soil management trials continue. Other projects discussed concern plum and pear breeding, black raspberry breeding for immunity to anthracnose, breeding of rose stocks, freezing preservation of fruits and vegetables, wrapping and dipping stored fruits, placement of apple trees with reference to soil erosion terraces, sweet potato storage, manuring of sweet potatoes and melons, onion breeding.

2329. LONG ASHTON. 634/635+664.84/85
Annual Report of the Agricultural and Horticultural Research Station, Long Ashton 1945, 1946, pp. 230.

An introductory review of work and events is followed by papers on particular investigations. These are all separately abstracted.

2330. MADRAS DEPARTMENT OF AGRICULTURE. 634.1/8(548)

Reports on the work of the agricultural stations in the Madras Presidency for 1943-44, 1945, pp. 412.

Fairly detailed accounts are given of work at the four fruit research stations. *Coonoor.* Stool bed trials of the Merton, Malling and Crab rootstocks continued. It is expressly noted that although the field incidence of woolly aphis on the station was severe, the Malling stocks remained free from the pest. [Similar reports were received from this station a year ago: the phenomenon is certainly unusual.] Trials are also recorded on pruning, fruit thinning, and espalier training of apples. In plum budding trials the shield-without-wood method resulted in a higher percentage of take than the flute method. Pear cuttings rooted more quickly and better when planted erect than when planted on the slant. Layering experiments on pear rootstocks are in progress, Kieffer pear was successfully grafted by whip and whip-and-tongue method on both quince A and quince C stocks.

Top-working *Pyrus chinensis* pears with Kieffer was nearly 90% successful using whip and cleft methods, but only 69% and 56% using whip-and-tongue or strap methods. Peach budding on common peach stocks gave little to choose between the flute and the shield-without-wood methods. Double working trials of peaches with plum intermediates were unsuccessful. Pruning systems for kaki are being tested. The following procedure was found most efficacious in rendering astringent kaki yellow, soft, non-astringent and ready for use. Pick fruit when fully mature but hard. Wrap singly in paper and place in a single layer in an air-tight chamber with nearly 100% moisture content. Profuse sweating takes place and in 48 to 72 hours the fruits are ready for use. Considerable attention is now paid to vegetable crops, both as regards cultivation and seed production, and work on these subjects is reported.

Burliar. Cherimoyer trees worked on Bullock's Heart (*Annona reticulata*) came into fruiting 6 years after planting, which compares favourably with the time taken by seedling cherimoyers. Limited success, 36% take, was achieved by inarching mangosteen on *Garcinia tinctoria.* Among successes in propagation experiments may be counted layering of cacao and inarching of cloves.

Kallar. But little success is reported in mangosteen vegetative propagation trials. However mangosteen seed sown within a week of extraction in sandy loam and peaty soil gave earlier and more complete germination (80% as against 50%) in the peaty than in the loam soil.

Kodur. In rootstock trials for Chinee Orange, union between scion and rootstock seemed best when pummelo was the stock. The grade of the particular rootstock was not found to be important. Acid lime worked on Gajanimma, Jamberi and acid lime gave much the highest yield on Gajanimma. Chinee orange worked on *Feronia elephantum* showed considerable promise as regards early and good bearing qualities. Lime pruning trials are in progress. Trials of the actual method of propagating mango, e.g. inarching, root grafting, etc., showed no significant differences in growth resulting. Nor was any difference apparent after 61 months from the use of rootstocks of different age. Double working trials on mango were successful. Field observations continue to show that mangos on polyembryonic rootstocks are much more vigorous than trees of the same variety of equal or even slightly higher age on monoembryonic rootstocks in adjoining plots. Mango variety trials continue. The disclosures made by excavations of sweet orange budded on sweet orange, on sweet orange seedling and on 1 Bangalora-Neelum root graft as to root systems are tabulated.

2331. D.S.I.R. NEW ZEALAND. 633/635 + 664.85(931)

Twentieth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1946, pp. 110, 2s.

As usual a tremendous amount of information is packed into a very small space. In some cases definite recommendations are now made, in others phenomena are noted. *Fruit Cold Storage Research.* Results of Jonathan gas storage tests can now be translated into commercial practice. Work proceeds on Sturmer and Granny Smith. The effect of the following factors on storage quality in a number of apple varieties is being tested:—rootstock (including E.M. stocks and Northern Spy), fertilizer treatment, strains showing highly-coloured fruit.

Fruit Research. Work at Appleby includes long- and short-term manurial trials, rootstock trials, variety trials. At Auckland rootstock trials continue and concern also citrus, kaki, feijoa, avocado and other sub-tropicals. Growth substance treatment to induce rooting and to delay fruit fall gave negative results. Plant disease investigations at Auckland concerned codling moth, crown gall, citrus canker, verticillium wilt of apricot, green crinkle (probably a virus) of apple, bitter rot fungus, bacterial spot of plums, dicky-rice weevil on citrus, testing of D.D.T. and Gammexane. At the Cawthron Institute magnesium deficiency studies show that ground dolomite applied to the soil in 1939/40 and 1940/41 had more lasting effects than magnesium sulphate or carbonate. Also from the Cawthron Institute come reports on copper spray residues in apples, vitamin C in apples—again Sturmer showed the highest value, 29 mg. per 100 g. whole fresh fruit, which fell only to 27 mg. after 6 months' storage—die-back in apples, black spot in pears, apple rootstocks at Annesbrook, raspberry fertilizers, raspberry disease survey and raspberry bud-moth.

Substantial progress is reported in tracing the fate of SO_2 added to fruit during the dehydration process [no details given]. Tests are in progress with 2,4-dichlorophenoxyacetic acid and its derivatives as weed killers. Among subjects under investigation by the Botany Division are linen flax, peat and pollen, medicinal plants (only the maintenance of nucleus stocks). The Plant Disease Division is concerned with a large number of diseases and their control, and short notes are given on the different phases of this work.

Tobacco Research. Work is reported on the following subjects:—soil sterilization, fertilizers, seed beds, ageing tobacco leaf, nutrition, soil analysis, diseases including mosaic, black root rot, damping off, angular leaf spot and collar rot, seed production, fire-cured tobacco, kilns and curing.

Cawthron Institute [see also above]. Improvements are reported in the application of Carolus' tissue testing method to apple, tobacco and tomato leaves. Considerable work has been devoted to tomato problems including: sterilization of glasshouse soil (steam preferable to formalin) and of outdoor soil, effect of adding compost, charcoal, etc., to clay soil on yield of tomatoes (marked improvement noted in glasshouse soils), effect of different rates of watering, "cloud", hard core.

Research work at Agricultural Colleges. J. S. Yeates of the Massey Agricultural College obtained improved rooting and growth of *Coleus* cuttings by artificially increasing the amount of CO_2 round the leaves of the cuttings. He also reports on trials of the factors influencing the rooting of azalea cuttings and on the use of various media including coconut fibre in the propagation of daphne cuttings.

2332. NIGERIA. 633/635(669)

Annual Report of Nigeria Agricultural Department for 1944, 1946, pp. 47, 2s.

Oil palms. A total of 520 acres has now been planted at the Oil Palm Research Station. From the work of earlier years

certain results are beginning to emerge. Thus clearing and burning the bush for the establishment of a palm plantation shows no advantage over non-burning, judging by the effect on the early growth. Moreover, palms grown with food crops interplanted, as in native practice, develop more quickly than those grown with a high or low bush or leguminous cover. Chemical work has shown that there is a distinction between acidity and rancidity. A series of experiments has shown the most satisfactory method of separating fruit from the bunch is to cut off the spikelets with the point of a cutlass and spread them out for 2 days, when the fruit will have become loose and easy to pick out. *Cocoa.* Selection continues. The limiting factors to Nigerian cocoa are capsids and drought. Limited success attended attempts to root cocoa cuttings. A cocoa survey is in progress and swollen shoot incidence was quickly established. *Hevea rubber.* It is noted that Benin will be the main centre for any future botanical work on rubber. *Kola.* Selection continues at Moor Plantation. Vegetative propagation by cuttings and budding is possible. *Coffee.* Robusta types now introduced show promise. Liberica is of poor quality and Arabica will not grow at low elevations. *Citrus.* Trials were laid down in 1932, using grapefruit and orange scions and sour orange, acid lime, sweet orange, grapefruit, tangerine, rough lemon and shaddock rootstocks. Ten years' figures show the best yields in both cases on sour orange. This stock is found to be resistant, though not immune, to gummosis, but its susceptibility to scab and hence control measures increase nursery expenses. Trial is now being made of the local Nigeria Green Orange and Sampson Tangelo, both apparently very resistant to gummosis, as rootstocks. *Mango.* Four varieties, Julie, Peter, Alphonse and Borsha, are under trial at Ibadan. *Groundnut.* Selection continued. Successful control was achieved of the beetle, *Pachymerus longus*, and further work was devoted to finding a control of *Aphanus sordidus*, a storage beetle. *Chillies.* Work is in progress on selection and multiplication of Nigerian Birdseye chillies. *Cinchona.* 313,000 *C. succirubra* and 63,000 hybrid trees have been planted at the close spacing of 80×80 cm. which will give a crop of prunings and thinnings at an earlier date than is normal. *Dates.* Selection is in progress. *European vegetables.* Production continued to expand. It was found possible to produce at Riyom seed from peas, radish, tomatoes, lettuce, carrots and cauliflower, though not at a cost which could compete with imported seed. As imported supplies are now more certain, seed research at Riyom is being largely discontinued.

2333. (NEERGAARD, P.) 632.4+632.952
6., 7., 9., 10. *Aarsberetning fra J. E. Ohlsens Enkes Plantepatologiske Laboratorium* 1940-1941, 1941-42, 1943-44, 1944-45. **(6th, 7th, 9th, 10th annual report of the Phytopathological Laboratory of J. E. Ohlsens Enkes.)** [English summaries pp 1½, 1, 1, ½.] Copenhagen, 1941, 1942, 1944, 1945, pp. 20, 17, 18, 24.

In each year the fungus diseases, observed in the seed testing laboratory and not previously reported in Denmark, are recorded. The 6th report includes an investigation on the effect of light treatment upon seeds and fungus spores; see *H.A.*, 16: 1260. Active immunization of carrot and tomato seedlings was not achieved in experiments, mentioned in the 7th report; see also *H.A.*, 14: 1108. For comparative tests of seed disinfectants and the toxic effect of *Stemphylium radicinum* see the 8th report, *H.A.*, 16: 563. The susceptibility of *Godetia hybrida* to fungus infection forms the chief subject matter of the 9th report. The 10th report contains a list of 39 publications issued by the Phytopathological Laboratory of J. E. Ohlsens Enkes and a general index to the first 10 reports (pp. 22).

2334. TRINIDAD AND TOBAGO. 633/635(729)
Administration Report of the Director of Agriculture, Trinidad, for the year 1943, being *Council Paper* **34** of 1944, 1944, pp. 16, 12 cents.
Ditto for the year 1944, being *Council Paper* **47** of 1945, 1945, pp. 16, 16 cents.

Brief notes are given in each report on experimental work with particular crops including the following:—*Cacao.* Of 32 clonal introductions from Peru in 1943 several had by 1944 shown no infection from witches' broom and the others negligible infection compared with surrounding trees and seedlings. Work on resistance to this disease continued at Harper Estate. *Citrus.* It is noted that a Departmental Bulletin is being published on the citrus rootstock trials using sour orange, Sweet Seville, rough lemon and wild grapefruit as stocks. The main conclusions are listed in the 1944 report. In the Marsh Grapefruit manurial trials noted in the 1943 report, potash gave significantly greater yields than the control and nitrogen gave significantly greater yields than potash and the control. The yield for N plus K was significantly greater than for N alone. K increased yields by 60%, whereas when N was added increases of nearly 300% were obtained. *Plant Pathology.* Reports are made on witches' broom control work and in the later report on two types of virus found on cacao and referred to as Red Mottle Virus and Vein-Clearing Virus. *Entomology.* A new insecticide of vegetable origin from Venezuela called sabadilla showed promise against froghopper. In the 1944 report general notes are given on pest incidence in different crops.

2335. WEST AFRICAN CACAO RESEARCH INSTITUTE. 633.74
Annual Report W.A.C.R I. April 1945 to March 1946, 1946, pp. 59 (stencilled).

Virus research. Different strains of virus and their relation to one another are being studied. Their rate of spread is under investigation. Recent trials indicate that swollen shoot virus is not seed-transmitted. Trials to determine whether coppicing in the early stages of the disease may provide a control measure indicate that when diseased trees are coppiced most of them will die quickly and too large a proportion will continue a temporary existence for this method to constitute an efficient method of control. Work on resistance is being carried out on three lines:—(1) Selection of potentially resistant material, (2) symptomatology of resistant material, and (3) nature of resistance. Alternative host plants are being studied. Replanting in gaps from which all trace of diseased trees has been removed has resulted in very little infection in the newly planted trees. A number of possible vectors of swollen shoot have been examined with definite results. Much attention is being devoted to the biology of the *Coccoidea* which attack cacao, especially those known to be disease vectors. *Capsids.* Work continues on capsids (*Sahlberghella* and *Distantiella*) and the damage caused by them alone and associated with the fungus *Calonectria rigidiuscula.* Bionomical studies of the capsids continue. A general decline in the past year in the amount of capsid damage in Nigeria is noted. Although *Ceiba pentandra* is well known as an alternative host of *Distantiella, Sahlbergella* has not as yet been observed on *Ceiba* in the field. Work on parasites which might possibly be used successfully against capsids has concerned a *Euphorus* sp., and mantids, spiders and the reduviid assassin bugs have been observed to prey on the capsids. The possibility of using the ant *Macromischoides aculeatus* for the purpose is also being examined. As regards chemical control a suitable solvent not harmful to the cacao tree is wanted before D.D.T. can be worth trying. Capsid damage does not appear to be connected with soil type. The work of the Division of Soil Science shows that there is no evidence for the theory that the incidence of swollen shoot is mainly associated with inherently poor soils. Moreover, although obviously recovery from capsid attack will be quicker on

good cacao soils, present evidence suggests no connexion between the presence of capsids and soil type. Three types of soil survey are now being undertaken, namely (1) a preliminary survey to identify the chief soils and their distribution, (2) reconnaissance soil surveys, and (3) detailed surveys of selected areas. The results of survey (1) are given here. Experiments have shown that conditions are best for the rooting of cacao cuttings when (1) the cutting carries a recently hardened flush, (2) the buds are dormant, (3) the cuttings are about 10 in. long, (4) the leaf area is reduced by one-third, (5) the propagator bins are shaded with cheese-cloth and (6) unsifted coarse river sand is used. The use of growth substances increased rooting by from 5% to 30%, the concentrated dip for 1 second being preferable to a 24-hour dilute dip. Leaf-bud, dwarf and root cuttings were all tried with fair success. The Amelonado cuttings rooted more slowly than the Trinitario. Insects responsible for cross pollination have been identified. Other experiments in progress concern manuring, shading (both lateral and overhead), rejuvenation.

2336. ZANZIBAR PROTECTORATE. 633/635(678.1)
Annual Report on the Zanzibar Department of Agriculture for 1945, 1946, pp. 27, S2.

Clove regeneration trials under various nurse crops and shade trees confirm previous observations that the trees under banana and *Gliricidia* shade are the most vigorous and healthy. The Uba cane on the contrary gives no top shade and draws very heavily on soil moisture. Analysis of soil indicates the presence of manganese in amounts which would be toxic in England and shows that both calcium and phosphorus content are abnormally low. It is noted that the extraction of oil from the Deli Oil Palm is rather less than 10% in Zanzibar as compared with 20% in West Africa and other countries. Soil and climate, uneven ripening of bunch and the use of very small presses would appear to be responsible. Selection of the Zanzibar orange continues at Kizimbani. A survey of cacao growing in the Protectorate suggests the possibility of this being developed into a major crop plant. The areas suitable for cacao are generally the many sheltered clove localities where the cloves have been brought low by sudden death, and new clove plantations in which the cloves could be used as permanent wind breaks. These would be planted wider than usual with several rows of cacao between. Derris, unfortunately, is not a very strong growing crop in Zanzibar. Other crops under observation, on which notes are given, include coffee, papaws, bananas, cassava, chillies.

2337. The following also have been examined:

a *A.R. Basutoland Dep. Agric. for year ended 30th September, 1945*, pp. 21.

b *14th A.R. Éire Minist. Agric., 1944-45*, pp. 152 +76, 3s. 6d.

c *Rep. Fermentation Industries for 1945*, pp. 17.

d *Nineteenth A.R. Northern Ireland agric. Res. Inst. Hillsborough, 1945-46*, 1946, pp. 32. Includes notes on flax disease trials.

e *66th A.R. N. Jer. St. agric. Exp. Stat. for 1944-45, (Science and the land)*, 1945, pp. 112. Report in form of question and answer.